OCUMENTS

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Energy in Latin America ■ Mobilization of domestic resources ■ Report and recommendations of the ECLA/ILPES Mission on the earthquake in Peru of 31 May 1970

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The Economic Bulletin for Latin America has been published by the secretariat of the Economic Commission for Latin America twice yearly since 1956. The essential purpose of this periodical is to provide a résumé of the economic situation of the region designed to supplement and bring up to date the information published in the Commission's annual economic surveys. Apart from this summary, which is to appear in every issue, special articles on different subjects related to the economy of Latin America are included, as well as informative and methodological notes.

The ECLA secretariat assumes entire responsibility for the *Bulletin.* Its content—intended for the information both of public officials and of the general reader—was not submitted to the Commission's member Governments before publication.

Since October 1958 the *Bulletin* has regularly included a Statistical Supplement. This subsequently became large enough to warrant separate publication, one issue being published in 1960, another in 1961 and two in 1962, each being bilingual with the corresponding table of contents. Since 1964, a new publication, the *Statistical Bulletin for Latin America,* has been issued twice a year, to provide the public with a regular flow of statistical data on economic matters.

EXPLANATION OF SYMBOLS

Three dots (. . .) indicate that data are not available or are not separately reported.

A dash (—) indicates that the amount is nil or negligible.

A minus sign (—300) indicates a deficit or a decrease.

A stroke (/) indicates a crop year or a fiscal year, e.g., 1954/55.

An asterisk (*) is used to indicate partially or totally estimated figures.

"Tons" and "dollars" are metric tons and United States dollars, respectively, unless otherwise stated.

Minor discrepancies in totals and percentages are due to rounding.

INTRODUCTION

This study has three basic purposes.

First, to describe the basic trends in Latin America's energy economy during the past decade. With this in mind, a number of topics are considered, including, for example, changes in the volume and composition of energy consumption and changes in such related matters as the level and composition of energy imports; the scale and general features of investment in the energy sector. Changes in legal and other institutional arrangements affecting the development of Latin America's energy economy are also examined. These matters are approached on both a regional and a country-by-country basis.

Second, to provide a preliminary estimate of the level and composition of energy consumption in Latin America during the 1970s. Within this context, particular emphasis is placed on Latin America's requirements for petroleum and electricity and on the implications of these requirements in terms of investment and the balance of payments.

Third, to indicate some of the major problems in energy policy that will confront Latin American governments during the 1970s. Suggestions are made for dealing with some of these problems, and a general approach to the subject of energy planning is considered.

ENERGY IN LATIN AMERICA

1. *Levels of consumption*

The data on gross consumption of commercial energy (petroleum, natural gas, coal, hydroelectricity and nuclear electricity) shown in table 1 for the years 1956 and 1966 reveal the present small share of total energy supplies consumed by the Latin American countries, which in the aggregate accounted for only 3.1 per cent of world consumption in 1966. In per capita terms, the region's average energy supply, consistently with its income levels, is relatively small, and in 1966 slightly exceeded 490 kilogrammes of petroleum equivalent, i.e., 42 per cent of average world consumption (1,166 kilogrammes) (see table 1).

Unfortunately, this big gap, and the still greater disparity between the average figures for Latin America and for the developed regions and groups of countries, will probably become yet wider, or at least remain unchanged, since the cumulative annual growth rate between 1956 and 1966 was only 2.8 per cent in Latin America as against a world figure of 2.9 per cent. Only in Western Europe and the United States were lower rates recorded in that period, but in both these areas, given their extremely high consumption levels, the per capita increase in absolute terms was several times larger than in Latin America. Over the same lapse of time, the annual growth rate for the other under-developed countries, taken as a group, was 7.8 per cent. If these trends persist, in the coming decade Latin America as a whole will show the lowest figure for per capita energy consumption of all the regions and groups of countries to which the tables refer.

Nevertheless, Latin America's relative share in world consumption of energy has slightly increased. The explanation lies in the region's high rate of population growth (2.9 per cent in recent years).

No reliable statistics are available on Latin America's consumption of non-commercial fuels (those of vegetable origin and the like), but estimates suggest that it may still represent about 40 million tons of petroleum equivalent, or roughly one third of the amount of commercial energy consumed.

It is of interest to note the importance that has been acquired in Latin America by hydrocarbons (petroleum, natural gas and petroleum products), which in 1966 covered some 80 per cent of gross consumption of commercial

Table 1

MAJOR AREAS AND GROUPS OF COUNTRIES: GROSS AND PER CAPITA CONSUMPTION OF COMMERCIAL ENERGY IN TERMS OF PETROLEUM EQUIVALENT,[a] 1956 AND 1966

Area or group of countries	*1956*			*1966*			*Annual percentage growth rate of consumption*	
	Total (millions of tons)	*Percentage of world total*	*Per capita (kilogrammes)*	*Total (millions of tons)*	*Percentage of world total*	*Per capita (kilogrammes)*	*Total*	*Per capita*
Latin America[b]	70	2.9	374	121	3.1	490	5.7	2.8
Western Europe	563	23.1	1,852	793	20.3	2,292	3.5	2.2
Eastern Europe	500	20.5	1,695	865	22.2	2,574	5.6	4.3
United States	927	38.1	5,518	1,306	33.5	6,629	3.5	1.9
Other developed countries[c]	203	8.3	1,538	366	9.4	2,377	6.1	4.5
Rest of world	172	7.1	102	447	11.5	216	10.0	7.8
WORLD TOTAL	*2,435*	*100.0*	*877*	*3,898*	*100.0*	*1,166*	*4.9*	*2.9*

SOURCES: For Latin America, ECLA, on the basis of official statistics. For other areas: *Statistical Papers*, Series J, No. 11, *World Energy Supplies 1963-1966* (United Nations publication, Sales No.: E.68.XVII.7).

[a] Measured in millions of tons of energy equivalent at 10.700 kCal/kg.

[b] Twenty-four countries only.

[c] Australia, Canada, Japan, New Zealand and South Africa.

energy. This was a considerably higher proportion than in the other major groups of countries; and than the share of hydrocarbons in the world average, which was about 53 per cent (see table 2). Since the Latin American percentage varied little during the 1960s, it may be assumed to represent an approximate maximum.

In all parts of the world (with the exception of a few individual countries) hydrocarbons are coming increasingly to the fore in the energy sector, chiefly as substitutes for coal.

The contribution made by hydroelectricity to energy consumption shows a rising trend in Latin America. By 1966 it had reached approximately 12 per cent. This high proportion is comparable to the corresponding figure for Western Europe, and is exceeded only in countries richly endowed with the appropriate natural resources (Canada, Norway, Sweden, etc.) (see table 2 below).

With respect to production of electric energy, a comparison between Latin America and the same groups of countries as before shows that their relative positions are very much the same as in the case of consumption (see table 3). In 1966 the region's per capita output was 433 kWh, which represented 40 per cent of the world average. Unfortunately, its total production—106,000 million kWh—accounted for only 3.0 per cent of the world total, a proportion which, except for slight fluctuations, has not altered for some twenty years past.

In real terms, the growth rate of production has not really been low in Latin America (8.2 per cent in 1956-1966), despite the standstill in economic development by which some countries were affected in certain years. It must be stressed, however, that the margin for expansion in this field is very wide, considering that similar annual rates of increase (7-9 per cent) have been recorded in countries as highly electrified as those of Western Europe (Norway, Sweden, etc.).

2. *Consumption of energy in relation to economic and social development*

The speed at which nations make economic headway is determined by a great many factors, such as educational levels, diversified supplies of raw materials, geographical location, soil and water resources, climate, the amount of capital available and the degree of intensity with which it is applied, and so forth. Energy, however, is a *sine qua non* for economic and social development.

It is at one and the same time a final consumer good and an input in almost all production processes, whether of goods or of services, although in this latter capacity it is used on the largest scale by the industrial sector.

The energy input is one of the determinants of manufacturing productivity, which in its turn exerts considerable influence on the community's income levels; and it is income that largely conditions the amount of energy used by the final consumer, not so much through his power to purchase energy itself as through his ability to buy the durable consumer goods whose operation entails the use of electricity.

The foregoing remarks highlight the close relationship not only between the level of income and the level of energy consumption,

Table 2

MAJOR AREAS AND GROUPS OF COUNTRIES: PERCENTAGE SHARE OF HYDROCARBONS AND HYDROELECTRICITY IN GROSS CONSUMPTION OF COMMERCIAL ENERGY, 1956 AND 1966

Area or group of countries	*Hydrocarbons*		*Hydroelectricity*	
	1956	*1966*	*1956*	*1966*
Latin America[a]	78.6	80.2	12.8	11.7
Western Europe	19.8	47.1	12.8	15.2
Eastern Europe	18.8	39.8	2.8	4.2
United States	65.8	72.7	5.8	5.5
Other developed countries[b]	28.4	49.4	31.1	22.0
Rest of world	32.4	28.1	5.3	5.2
World total	*40.3*	*52.7*	*9.0*	*8.9*

Sources: For Latin America, ECLA, on the basis of direct information. For other areas, *Statistical Papers*, Series J, No. 11, *World Energy Supplies 1963-1966* (United Nations publication, Sales No.: E.68.XVII.7).

[a] Twenty-four countries only.

[b] Australia, Canada, Japan, New Zealand and South Africa.

Table 3

MAJOR AREAS AND GROUPS OF COUNTRIES: TOTAL AND PER CAPITA PRODUCTION OF ELECTRIC ENERGY, 1956 AND 1966

Area or group of countries	*1956*		*1966*		*Percentage annual growth rates*	
	Total (thousands of millions of kWh)	*Per capita (kWh)*	*Total (thousands of millions of kWh)*	*Per capita (kWh)*	*Total (thousands of millions of kWh)*	*Per capita (kWh)*
Latin America[a]	48	251	106	433	8.2	5.3
Western Europe	422	1,388	875	2,529	7.6	6.2
Eastern Europe	272	922	730	2,173	10.4	8.9
United States	685	4,077	1,248	6,335	6.3	4.6
Other developed countries[b]	202	1,530	455	2,954	8.5	6.8
Rest of world	64	38	186	90	11.3	9.0
WORLD TOTAL	*1,692*	*609*	*3,601*	*1,077*	*7.9*	*5.9*

SOURCES: For Latin America, ECLA, on the basis of official statistics. For other areas, *Statistical Papers*, Series J, Nos. 4 and 11 (United Nations publications, Sales Nos.: 60.XVII.6 and 68.XVII.7).

[a] Twenty-four countries only.

[b] Australia, Canada, Japan, New Zealand and South Africa.

but also, up to a point, between this latter and the rate of investment in a given economy. In a sense, demand for energy is "derived" from investment in equipment, machinery and appliances which need it as an input.

The close linkage between the level of income and that of energy consumption does not mean, however, that the former is the sole determinant of the amount of energy—much less of a specific kind of energy—consumed. Different countries may attain the same income level with widely differing structures of production; in that case, their consumption of energy will also differ, for when energy is used as a productive factor, input per unit of output varies considerably from manufacturing industry to agriculture or services. The average input by sector also changes a good deal according to the composition of the sector in terms of its basic activities.

On various occasions, ECLA has analysed the correlation between net consumption of energy and the per capita gross product; one such analysis, which related to commercial energy and covered 55 countries, including all those of Latin America (applicable in the early 1960s), showed a correlation coefficient of 0.93. The coefficient of income-elasticity of demand was above 1.4.

Figure I presents, for Latin America as a whole and by countries, the relationship between per capita consumption of commercial energy and the per capita gross domestic product, taking the annual averages for 1955-1956 and 1965-1966. The points at which each curve begins and ends indicate, respectively, the relevant situation in the initial and in the final period, so that the curve shows the evolution of consumption of commercial energy in the decade in question. The parallel lines at an angle of 45°, each of which represents a constant consumption of petroleum equivalent per dollar of gross product (1, 2, 3, etc., kilogrammes of petroleum per dollar), help to quantify the various levels of consumption. It should be noted that for Latin America as a whole and for most of the individual countries, the slope of the parallel lines is considerably steeper than 45°, showing that energy consumption increased very much more rapidly than the gross product.

Most of the observations formulated with respect to total energy are also applicable to demand for electric energy in particular. The latter, however, has a special dynamic impetus closely linked to the over-all process of technological innovations and advances, which explains why the historical growth rate of electricity consumption even farther outstrips that of the gross product, and in some cases increases during periods when the product declines.

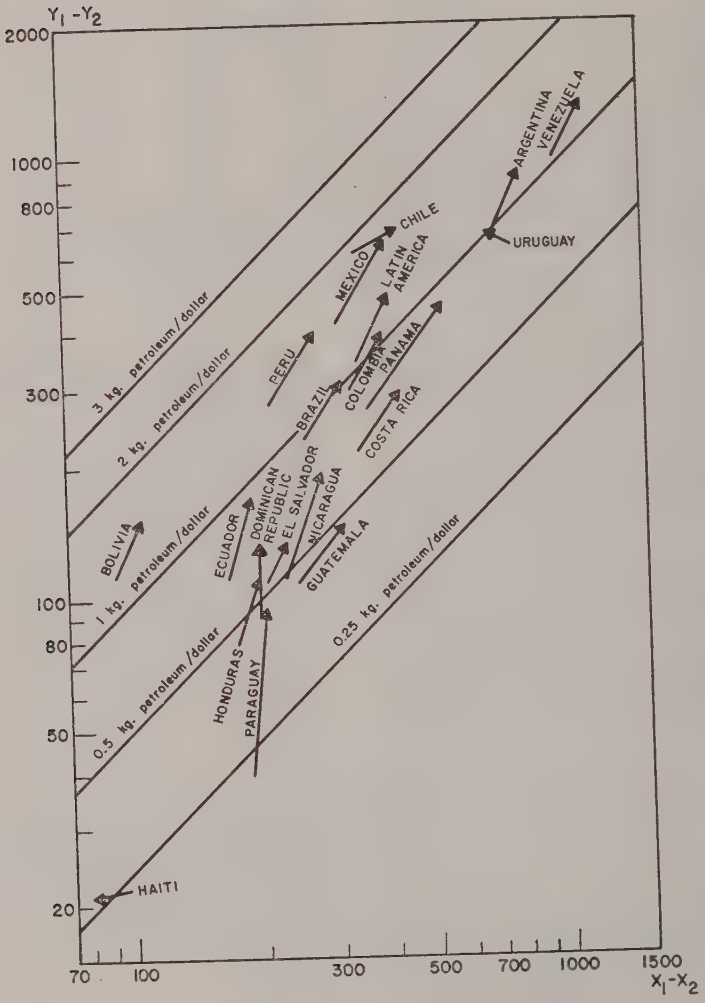
With due allowance for the drawbacks of applying the method of simple correlation to economic series, which by their very nature increase through time (especially if, as in the present instance, they relate to only a few points), the regression lines of a domestic gross-product/net electricity-consumption graph for the Latin American countries, relating to 1955-1957 and 1965-1967, are presented in figure II.

Figure I

LATIN AMERICA: COMPARISON OF TRENDS OF PER CAPITA COMMERCIAL ENERGY CONSUMPTION AND PER CAPITA GROSS DOMESTIC PRODUCT

(Averages 1955-1956 and 1965-1966)

Logarithmic scale



Note: $X_1 - X_2$ = Gross product (dollars at 1960 prices per inhabitant) at factor cost.

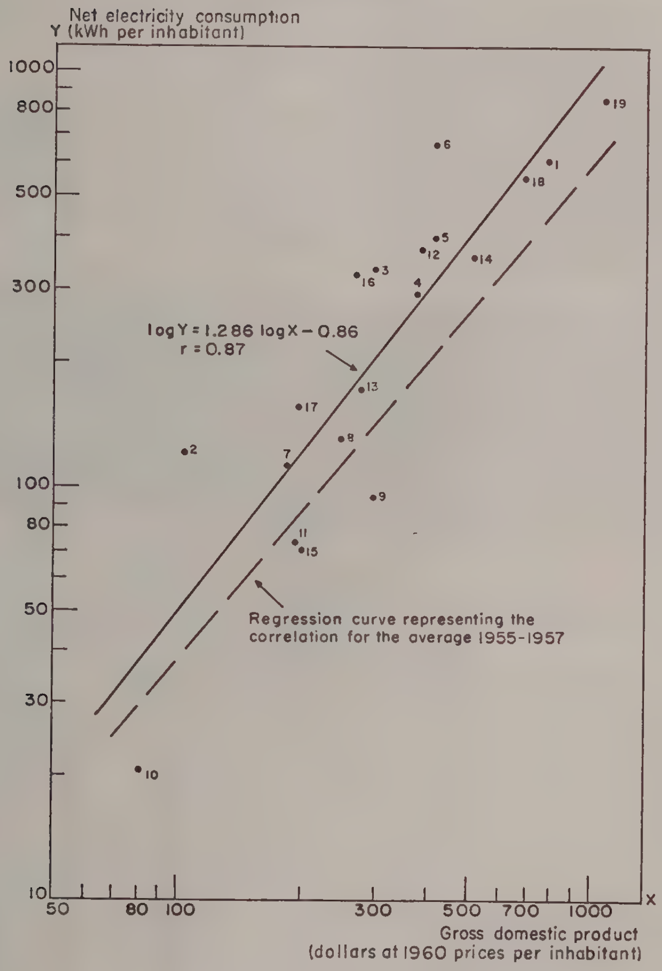
$Y - Y$ = Commercial fuel consumption (kg of petroleum equivalent per inhabitant).

Figure II

LATIN AMERICA: CORRELATION BETWEEN NET PER CAPITA ELECTRICITY CONSUMPTION AND PER CAPITA GROSS PRODUCT

(Average 1965-1967)

Logarithmic scale



Note: 1. Argentina
2. Bolivia
3. Brazil
4. Colombia
5. Costa Rica
6. Chile
7. Ecuador
8. El Salvador
9. Guatemala
10. Haiti
11. Honduras
12. Mexico
13. Nicaragua
14. Panama
15. Paraguay
16. Peru
17. Dominican Republic
18. Uruguay
19. Venezuela

The slopes of the two regression lines (equivalent to the income-elasticity of consumption) proved to be fairly similar; the more recent is above the one corresponding to the earlier date, with a vertical shift ranging from 40 to 65 per cent and thus averaging nearly 55 per cent.

This shift over a period of ten years can be taken as an indication of the rate of electrification of the Latin American economy, or, in other words, of the degree in which average consumption of electricity increased (given a constant level of income). This implies that in each country the growth of demand for electricity is partly attributable to the rise in income and partly to the combination of technological progress, better income distribution and the substitution of electricity for other forms of energy.

In figure III each country's net consumption of electricity per capita is related to its per capita gross product, with reference to the annual averages for 1955-1957 and 1965-1967. The vectors joining the initial and final points in each country or in the region as a whole indicate the characteristics of the evolution of electricity consumption in the decade considered. The slope of the vector for Latin America as a whole is approximately 3 in 2. Hence electricity consumption increased almost one and a half times as fast as the gross product; a similar ratio is recorded in several countries of Western Europe, although at very different consumption levels.

The share of electricity in world consumption of commercial energy, which was 24 per cent in 1956, may be estimated to have risen to 29 per cent by 1966.[1]

Trends in consumption of electricity in relation to that of other kinds of commercial energy are reflected in the electrification coefficient, which is the quotient of electricity consumption in kWh and consumption of commercial fuels as such, converted into terms of petroleum equivalent.

From table 4 it can be seen that in Latin America as a whole the electrification coefficient rose by nearly 32 per cent between 1957 and 1967. Only in Bolivia, Chile, Panama and Paraguay did it decrease, as the result of a boom in consumption of hydrocarbons.

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[1] "Degree of electrification": ratio between generation of electric energy and total consumption of commercial energy, both expressed in the same unit terms.

Table 4

LATIN AMERICA: ELECTRIFICATION COEFFICIENTS, 1957 AND 1967

(kWh/kg of petroleum equivalent)

Country	*1957*	*1967*	*1967 Index numbers (1957 = 100)*
Argentina	0.65	0.82	127.3
Bolivia	1.60	1.09	68.2
Brazil	1.87	2.02	107.7
Colombia	1.09	1.36	124.5
Costa Rica	2.27	2.43	107.1
Chile	2.13	1.67	78.5
Ecuador	0.73	0.92	126.0
El Salvador	1.02	1.44	141.2
Guatemala	0.55	1.64	299.5
Haiti	0.97	1.04	107.2
Honduras	0.42	0.90	215.0
Mexico	0.64	0.80	124.4
Nicaragua	1.01	1.28	125.9
Panama	0.63	0.52	81.8
Paraguay	0.95	0.85	90.7
Peru	0.81	1.08	133.3
Dominican Republic	1.10	1.46	133.2
Uruguay	0.95	1.30	136.7
Venezuela	0.39	0.79	200.8
TOTAL *Latin America*	*0.85*	*1.12*	*131.8*

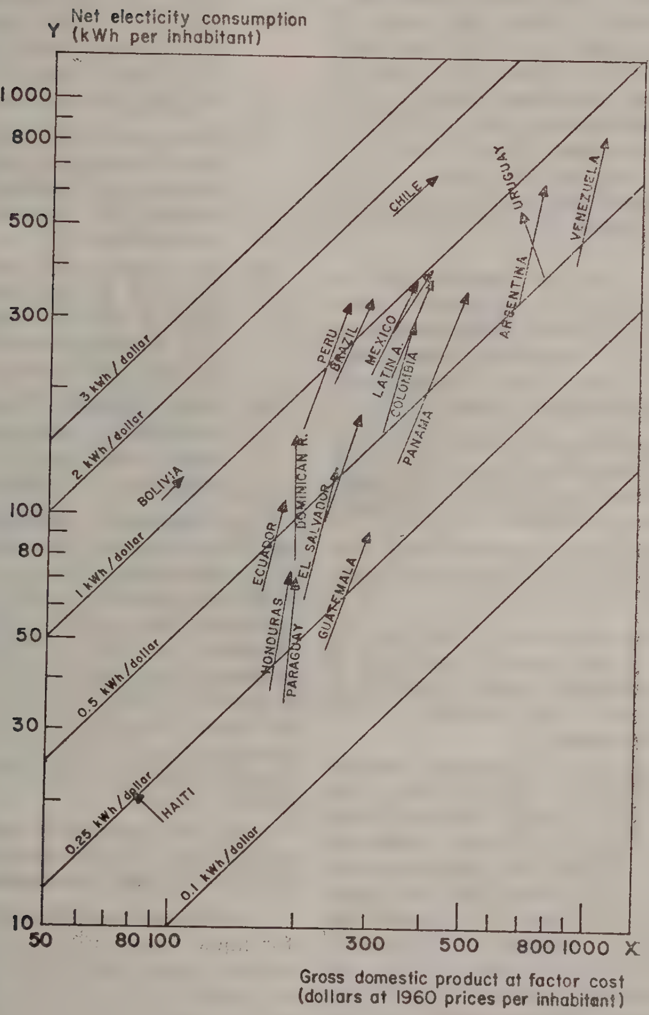
SOURCE: ECLA, on the basis of direct information.

Figure III

LATIN AMERICA: CORRELATION BETWEEN NET PER CAPITA ELECTRICITY CONSUMPTION AND PER CAPITA GROSS PRODUCT

(Averages 1955-1957 and 1965-1967)

Logarithmic scale



The next step is to study, with separate reference to hydrocarbons and electricity, the salient economic questions (consumption, production, sources of supply, institutional organization, investment, prices and tariff rates, legal matters, etc.) linked to these two kinds of commercial energy, which are by far the most commonly used in the region. This analysis, besides dealing with the recent situation, will also review the development pattern followed in the past decade, together with its causes and its repercussions on the over-all economy. Thus, on the basis of the trends observed, an attempt is made to form some idea of the outlook for the 1970s.

First, however, it will be useful to look at table 5, which presents an approximate comparison, by countries, between gross production and consumption of commercial energy and vegetable fuels in 1966. The following are among the points brought to light:

(1) Latin America's total output of energy is more than double the amount consumed, owing to Venezuela's leading position as an exporter of petroleum;

(2) One fourth of the region's total consumption of energy is covered by vegetable fuels;

(3) Consumption of coal in Latin America amounts to less than 4.5 per cent of total consumption, and to satisfy it imports have to be brought in from outside the region;

(4) Venezuela apart, Argentina, Bolivia, Chile, Colombia, Mexico, Peru and Trinidad and Tobago were the only countries whose domestic production in 1966, in terms of calorific power, equalled or exceeded their own consumption. But since the natural gas produced in Argentine and Chile could not all be utilized, only six of the Latin American countries had favourable net trade balances under the head of fuels.

1. *Petroleum*

(a) *Trends in consumption of hydrocarbons in Latin America. Main consumer sectors*

Consumption of hydrocarbons in Latin America has pursued a fluctuating upward trend, and currently represents over 80 per cent of demand for commercial energy. In the growth pattern of this demand the following general tendencies are observable:

(i) Average per capita consumption of petroleum and petroleum products is relatively high in comparison with the corresponding world figure (especially with the exclusion of the United States), and so is its rate of increase;

(ii) There are wide inter-country disparities in respect of both per capita consumption of petroleum products and natural gas and their share in total consumption;

(iii) In countries that are major exporters of crude oil and petroleum products, bunkers and consumption in oilfields and refineries account for a high proportion of total demand;

(iv) The incidence of natural gas in the structure of consumption of hydrocarbons is very marked in the countries which are its leading consumers.

Latin America's consumption of the main liquid fuels derived from petroleum, including the consumption of the petroleum industry itself and excluding sales to ships (bunkers) expanded (in terms of petroleum equivalent calculated at 10,700 kilocalories to the kilogramme) from approximately 40 million tons to about 71 million between 1955 and 1966, the latter being the last year for which complete data were available at the time of preparing the present notes (see tables 6 and 7 below).

Hence the cumulative annual growth rate of demand was 5.3 per cent, i.e., lower than in 1945-1955, when it had exceeded 10 per cent.

This slackening of the growth rate of demand for liquid hydrocarbons in more recent years reflects varying rates of increase in consumption of the different petroleum products. A falling-off, in absolute terms, is observable in consumption of kerosene for household use, which has been largely superseded by liquid gas and natural gas. This decline, however, is offset by the increase in consumption of jet fuel, which is included under the same statistical head, for want of data on which to base a satisfactory breakdown. The growth rate of consumption of fuel-oil continues to decrease, as a result of the partial replacement of fuel-oil

Table 5

LATIN AMERICA[a]: GROSS PRODUCTION AND CONSUMPTION OF COMMERCIAL ENERGY AND VEGETABLE FUELS, 1966

(Thousands of tons of 10,700 kCal/kg petroleum equivalent)

Country	Production						Consumption					
	Coal	Crude petroleum	Natural gas	Hydroelectricity[b]	Vegetable and other fuels	Total	Coal	Petroleum products	Natural gas	Hydroelectricity[b]	Vegetable and other fuels[c]	Total
Argentina	184	14,990	5,161	376	1,760	22,381	770	15,523	3,917	313	1,760	22,283
Bolivia	—	793	273	145	730	1,941	—	417	83	124	730	1,354
Brazil	1,317	5,805	686	8,606	14,310	30,724	1,769	16,610	90	6,971	14,310	39,750
Colombia	1,580	9,938	2,436	1,174	3,050	18,178	1,580	3,714	887	987	3,050	10,218
Chile	950	1,620	5,788	1,285	970	10,613	1,160	3,472	500	1,092	970	7,194
Ecuador	—	342	220	99	1,270	1,931	—	770	—	74	1,270	2,114
Paraguay	—	—	—	—	390	390	—	183	—	—	390	573
Peru	47	3,075	1,635	859	1,850	7,466	50	3,909	80	756	1,850	6,645
Uruguay	—	—	—	431	90	521	26	1,565	—	332	90	2,013
Venezuela	21	176,065	35,908	428	660	213,082	165	5,131[d]	5,966	342	660	12,264
Costa Rica	—	—	—	181	260	441	—	283	—	155	260	698
Cuba[e]	—	45	—	—	3,430	3,475	—	5,013	—	—	3,430	8,443
El Salvador	—	—	—	127	550	677	—	322	—	109	550	981
Guatemala	—	—	—	38	810	848	—	567	—	33	810	1,410
Haiti	—	—	—	—	1,100	1,100	—	101	—	—	1,100	1,201
Honduras	—	—	—	40	430	470	—	313	—	35	430	778
Mexico	1,410	19,919	13,037	3,119	5,640	42,525	1,600	15,491	8,578	2,589	5,640	33,898
Nicaragua	—	—	—	59	370	429	—	300	—	48	370	718
Panama	—	—	—	104	180	284	—	558	—	92	180	830
Dominican Republic	—	—	—	16	900	916	—	552	—	12	900	1,464
Guyana[e]	—	—	—	—	260	260	—	350	—	—	260	610
Jamaica	—	—	—	43	530	573	—	1,192	—	35	530	1,757
Suriname[e]	—	—	—	26	60	86	—	250	—	25	60	335
Trinidad and Tobago[e]	—	7,815	3,180	—	190	11,185	—	1,373[d]	1,200	—	190	2,763
TOTAL *Latin America*	*5,509*	*239,807*	*68,324*	*17,156*	*39,790*	*370,496*	*7,120*	*77,959*	*21,301*	*14,124*	*39,790*	*160,294*

SOURCE: ECLA, on the basis of information from various sources.

[a] Including (as an exception) several countries (Cuba, Guyana, Surinam, Trinidad and Tobago) for which statistical data are not available.

[b] 1 kWh is taken to equal 3,300 kCal.

[c] Only household consumption (0.180 tons of petroleum equivalent per consumer) and consumption of bagasse in the sugar industry are taken into account.

[d] Excluding ships' bunkers.

[e] The figures for consumption of petroleum products are estimates.

Table 6

LATIN AMERICA: GROSS CONSUMPTION OF MAIN PETROLEUM PRODUCTS AND NATURAL GAS, 1955, 1960, 1965 AND 1966

(Thousands of tons of 10,700 kCal/kg petroleum equivalent)

Country	Petroleum products				Natural gas				Total			
	1955	1960	1965	1966	1955	1960	1965	1966	1955	1960	1965	1966
Argentina	10,240	12,628	15,405	15,523	626	1,203	3,673	3,917	10,866	13,831	19,078	19,440
Bolivia	259	278	396	417	—	15	74	83	259	293	470	500
Brazil	8,672	12,375	15,416	16,610	—	58	88[a]	90[a]	8,672	12,434	15,504	16,700
Colombia	2,042	2,786	3,400	3,714	200	252	760[a]	887[a]	2,242	3,038	4,160	4,601
Costa Rica	114	190	256	283	—	—	—	—	114	190	256	283
Chile	1,749	2,237	3,120	3,472	70	244	450	500	1,819	2,481	3,570	3,972
Ecuador	365	547	729	770	—	—	—	—	365	547	729	770
El Salvador	149	196	317	322	—	—	—	—	149	196	317	322
Guatemala	316	461	526	567	—	—	—	—	316	461	526	567
Haiti	85	88	93	101	—	—	—	—	85	88	93	101
Honduras	136	191	210	313	—	—	—	—	136	191	210	313
Jamaica	...	898[b]	1,084	1,192	—	—	—	—	...	898	1,084	1,192
Mexico	9,700	12,855	14,139	15,491	1,465	2,808	7,428	8,578	11,165	15,663	21,567	24,069
Nicaragua	129	179	288	300	—	—	—	—	129	179	288	300
Panama	241	343	534	558	—	—	—	—	241	343	534	558
Paraguay	55	103	175	183	—	—	—	—	55	103	175	183
Peru	1,695	2,300	3,644	3,909	46	46	75[a]	80[a]	1,741	2,346	3,719	3,989
Dominican Republic	266	312	374	552	—	—	—	—	266	312	374	552
Uruguay	1,020	1,210	1,521	1,565	—	—	—	—	1,020	1,210	1,521	1,565
Venezuela[c]	3,104	3,907	4,870	5,131	2,391	4,007	5,688	5,966	5,495	7,914	10,558	11,097
TOTAL *Latin America*	*40,337*	*54,084*	*66,497*	*70,973*	*4,798*	*8,633*	*18,236*	*20,101*	*45,135*	*62,717*	*84,733*	*91,074*

SOURCE: ECLA, on the basis of official statistics.

[a] Estimates.

[b] Year 1961.

[c] Excluding ships' bunkers.

by natural gas. Consumption of liquid gas and gasolines expands at relatively constant rates, while some speeding-up is to be noted in the case of diesel and gas oil.

Between 1955 and 1956, consumption of natural gas increased from 5 million to 20 million tons of petroleum equivalent, or at an annual rate of 13.9 per cent. If consumption of petroleum products and natural gas is considered in the aggregate, the annual growth rate works out at about 6.6 per cent.

It can be seen from table 6 that Argentina, Brazil, Mexico and Venezuela are the leading consumers in Latin America, followed by Colombia, Chile, and Peru. The first four countries listed account for about 80 per cent of the region's demand for hydrocarbons; if the consumption of the other three is added, the resulting total represents over 90 per cent.

In the case of the first four major consumers, the share of light derivatives—liquid gas in particular—and medium products has been following an upward trend, owing to the gradual ousting of fuel oil, for which natural gas is the chief substitute.

The structure of consumption of petroleum products shows a rise in the proportion represented by gasolines, whereas fuel oil and domestic-purpose kerosene continue to be affected by competition from natural gas and liquid gas. The impact of natural gas on the structure of consumption of petroleum products is marked, and has repercussions on almost all derivatives, the exception being gasoline. While apparent consumption of natural gas as fuel increased fivefold in 1955-1966, that of fuel oil was not so much as trebled. Throughout the whole of the period considered, consumption of natural gas and fuel oil taken together stood at 50 per cent of total consumption of hydrocarbons, in terms of calorific equivalent. It should be noted that in Brazil, up to now, consumption of natural gas has remained incomparably lower than in Argentina, Mexico and Venezuela.

Consumption of petroleum derivatives, by countries and products, is shown in terms of cubic metres in table 7.

The object of table 8 is to evaluate the distribution of domestic consumption of liquid petroleum products among the various economic sectors in Latin America, and compare it with the corresponding breakdown for other areas.

It should be noted that the inclusion of deliveries to ships (bunkers) would considerably raise the level of consumption in the transport sector, while if natural gas were included it would be mainly in industry and mining that consumption would increase.

The pattern of consumption by sectors varies a great deal from one Latin American country to another. In some cases transport plays the leading role, while in the more highly industrialized countries very large proportions are absorbed by industry. In those of the chief petroleum-producing countries where there is no particular accent on industrial consumption, that of the petroleum sector itself moves into the front rank.

(b) *Production, refining, marketing and transport*

Although petroleum production in Latin America has expanded at a steady rate, its relative position in the world picture has plainly deteriorated. From 1950 onwards, the region's share in world output of crude remained stationary at first, and subsequently declined. During the decade under consideration, Latin America did not succeed in doubling its volume of production, while its traditional competitors trebled and quadrupled theirs, and new areas emerged as producers accounting for a significant share, as in the case of Africa.

In relative terms, therefore, Latin America is losing ground as a major world producer and exporter, although its volumes of output continue to increase. Table 9 shows how the region is being squeezed out by other producer areas under the stimulus of their vigorous development. Particularly noteworthy is the competition from the Middle East and North Africa, to which areas Nigeria must be added as from 1965.

Except in Bolivia, Cuba and Ecuador (where output actually decreased) and Peru, production in the countries of the region expanded considerably in 1955-1960 (see table 10). During the next five-year period the increase achieved was more modest, except in Argentina, Colombia, Mexico and Venezuela, where it was sizable. Ecuador showed a slight recovery, and, later, an appreciable upswing took place in Bolivia.

The foregoing trends are reflected in a rise of about 70 per cent in the totals for Latin America between 1955 and 1965. If Venezuela is excluded, the production figure doubles in the same period.

Output of natural gas—production of which has so far been closely associated with that

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LATIN AMERICA: GROSS CONSUMPTION OF M

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Country	Liquid gas				Gasoline				
	1955	*1960*	*1965*	*1966*	*1955*	*1960*	*1965*	*1966*	*19*
Argentina	94	187	883	1,019	2,239	2,754	4,259	4,497	1,2
Bolivia	...	...	...	...	130	145	201	219	
Brazil	155	643	1,385	1,526	3,805	4,863	6,244	6,840	7
Colombia	20	72	184	209[a]	1,208	1,510	2,005	2,204	2
Costa Rica	—	2	3	3	54	99	91	97	
Chile	—	44	214	284	538	775	1,092	1,206	2
Ecuador	—	1	4	4	189	271	376[a]	382	
El Salvador	2	2	9	6	81	100	103[a]	105	
Guatemala	—	6	23	24	117	166	209[a]	201[a]	
Haiti	—	1	1	1	48	46	42	45[a]	
Honduras	—	2	2	3	39	52	66[a]	74	
Jamaica	...	3	16	20	...	127	118	126	.
Mexico	367	1,188	2,391	2,644	3,426	4,687	5,808	6,216	1,3
Nicaragua	—	1	2	2	63	86	120[a]	125[a]	
Panama	...	...	...	...	105	174	216[a]	225[a]	
Paraguay	—	—	—	—	32	49	57	58[a]	
Peru	6	11	38	49	717	954	1,366	1,479	2
Dominican Republic	...	...	...	...	109	116	98	299	
Uruguay	—	2	33	40	337	338	367	370[a]	1
Venezuela[c]	44	429	633	710	1,656	2,446	2,987	3,170	4
TOTAL	*688*	*2,594*	*5,821*	*6,544*	*14,893*	*19,758*	*25,825*	*27,934*	*4,8*

SOURCE: ECLA, on the basis of official statistics.

[a] Estimates.

TROLEUM PRODUCTS, 1955, 1960, 1965 AND 1966

ic metres)

Kerosene			*Gas oil and diesel oil*				*Fuel oil*			
60	*1965*	*1966*	*1955*	*1960*	*1965*	*1966*	*1955*	*1960*	*1965*	*1966*
73	1,351	1,267	1,875	2,756	4,356	4,294	6,279	6,962	7,248	7,183
52	79	88	39	53	79	73	109	83	115	119
57	902	945	1,646	3,097	4,178	4,524	3,901	5,310	5,794	6,154
61	302	375	316	496	665	682	662	1,001	981	1,053
16	18	19	30	90	195	198[a]	43	23	—	22[a]
66	375	398	257	339	580	664	1,022	1,185	1,434	1,573
53	98	105	59	111	147	167	151	212	246	258
33	42	46	16	38	97	105	59	61	123	117
41	50[a]	50[a]	40	100	164[a]	180[a]	190	225	181[a]	215
3	6	7[a]	[b]	[b]	[b]	[b]	49	52	58	64[a]
13	21	25	37	85	84[a]	119[a]	77	71	74[a]	142
76	142	161	...	171	200	310	...	538	747	735
63	2,046	2,145	1,297	1,984	3,193	3,553	5,077	5,725	3,981	4,505
20	40[a]	42[a]	[b]	[b]	[b]	[b]	68	102	174[a]	180[a]
37	50[a]	52[a]	42	57	98[a]	105[a]	111	139	259[a]	270[a]
24	30	32[a]	10	16	21	23[a]	14	35	95	98[a]
78	640	709	340	519	870	885	658	764	1,380	1,488
18	13	35	73	[b]	[b]	[b]	115	224	310	315
33	214	209[a]	191	228	329	370[a]	464	600	814	825[a]
88	691	689	516	788	993	1,018	1,036	617	783	838
05	*7,110*	*7,399*	*6,784*	*10,928*	*16,159*	*17,270*	*20,085*	*23,929*	*24,797*	*26,154*

[b] Included under fuel oil.

[c] Excluding ships' bunkers.

Table 8

LATIN AMERICA AND OTHER AREAS: DOMESTIC CONSUMPTION OF PETROLEUM PRODUCTS, BY SECTORS, 1960[a]

(Percentage distribution)

Area	*Industry and mining*	*Thermo-electricity*	*Transport*	*Residential sector*	*Other*
Latin America	30	12	37	16	5[b]
United States	10	6	53	25	6
Western Europe[c]	32	5	33	23	7

SOURCE: ECLA, on the basis of official statistics.

[a] Excluding natural gas and ships' bunkers.

[b] Estimates.

[c] European Coal and Steel Community.

Table 9

WORLD: CRUDE PETROLEUM PRODUCTION, BY MAJOR AREAS, 1955-1967 (SELECTED YEARS)

(Thousands of barrels daily)

Area	*1955*	*1960*	*1964*	*1965*	*1966*	*1967*
United States and Canada	7,162	7,551	8,403	8,541	9,195	9,773
Middle East	3,308	5,250	7,707	8,241	9,237	9,947
Soviet Union and other socialist areas	1,640	3,230	4,660	5,280	5,901	6,239
Latin America	2,747	3,767	4,547	4,648	4,613	4,912
Africa	—	276	1,734	2,226	2,741	3,132
Other	601	850	1,019	1,104	1,105	1,181
WORLD TOTAL	*15,458*	*20,924*	*28,070*	*30,040*	*32,792*	*35,184*
Percentage share of Latin America	17.8	18.0	16.2	15.5	14.1	14.0

SOURCES: For Latin America, ECLA, on the basis of official statistics. For other areas, *World Oil* and *Oil and Gas Journal* (various issues).

Table 10

LATIN AMERICA: CRUDE PETROLEUM PRODUCTION, 1955-1967 (SELECTED YEARS)

(Thousands of cubic metres)

Country	*1955*	*1957*	*1960*	*1965*	*1967*
Argentina	4,850	5,398	10,178	15,625	18,242
Bolivia	428	568	569	594	2,310
Brazil	321	1,607	4,708	5,460	8,509
Colombia	6,314	7,273	8,867	11,638	11,031
Cuba	60	63	25	29	135
Chile	410	689	1,150	2,020	1,966
Ecuador	561	507	438	453	347
Mexico[a]	14,526	14,658	17,293	21,008	23,835
Peru	2,741	3,056	3,063	3,663	4,110
Trinidad and Tobago	3,958	5,416	6,735	7,769	10,334
Venezuela	125,183	161,281	165,613	201,533	205,551
TOTAL *Latin America*	*159,352*	*201,516*	*218,639*	*269,737*	*286,370*
TOTAL *(excluding Venezuela)*	*34,169*	*40,235*	*53,026*	*68,204*	*80,819*

SOURCE: ECLA, on the basis of official statistics.

[a] Including absorption liquid.

of petroleum—has increased at a steady and rapid rate (see table 11). It must be stressed, however, that levels of utilization of the gas produced remained extremely low in the 1960s, despite an improvement in more recent years. As a general rule, a substantial part of the gas produced is reinjected on the oilfields to maintain pressure in the wells; part is used as fuel by other sectors as well as by the petroleum industry itself; and part is wasted (burnt in the atmosphere). The volumes used for the first two purposes are shown in table 12.

Rates of expansion of refining in Latin America were slow up to 1950, speeded up between 1955 and 1960 (when the annual rate was 10.3 per cent) and showed signs of slackening in the later years of the period (dropping to about 6 per cent in 1960-1965).

By the beginning of 1967 Latin America's refining capacity amounted to 3.6 million barrels of crude daily (see table 13).

During the 1960s, the aim of all the Latin American countries was to approach self-suf-

Table 11

LATIN AMERICA: NATURAL GAS PRODUCTION, 1955, 1960, 1965 AND 1966

(Millions of cubic metres)

Country	*1955*	*1960*	*1965*	*1966*
Argentina	1,065	3,550	6,236	5,932
Bolivia	—	168	212	314
Brazil	62	535	683	789
Colombia	1,800	2,338	2,650[a]	2,800[a]
Chile	466	2,194	6,215	6,653
Ecuador	180	185	251	253
Mexico	3,412	9,665	13,965	14,985
Peru	1,011	1,952	1,847	1,879
Trinidad and Tobago	...	2,765	3,263	3,655
Venezuela	24,308	31,561	40,846	41,274
TOTAL *Latin America*	*32,304*	*54,913*	*76,168*	*78,534*

SOURCE: ECLA, on the basis of official statistics.

[a] Estimates.

Table 12

LATIN AMERICA, UTILIZATION OF NATURAL GAS, 1955, 1960 AND 1965

(Millions of cubic metres)

Country	*1955*		*1960*		*1965*	
	Reinjected	*Used as fuel*	*Reinjected*	*Used as fuel*	*Reinjected*	*Used as fuel*
Argentina	6	719	676	1,383	230	4,222
Bolivia	—	—	17	17	8[a]	85
Brazil	—	—	19	66	263	100[a]
Colombia	200	230	166	290	320[a]	875
Chile	324	80	1,306	280	4,486	520
Mexico	391	1,684	2,761	3,228	1,251	8,538
Peru	70	53	75	53	52	86[a]
Trinidad and Tobago	...	...	305	766	392	1,174
Venezuela	3,891	2,748	11,063	4,606	17,720	6,538
TOTAL *Latin America*	*4,882*	*5,514*	*16,388*	*10,689*	*24,722*	*22,138*

SOURCE: ECLA, on the basis of official statistics.

[a] Estimates.

Table 13

LATIN AMERICA: REFINING CAPACITY, 1955, 1960, 1965 AND 1967

(Millions of barrels of crude daily)[a]

Country	*1955*	*1960*	*1965*	*1967*
Argentina	189.1	237.5	423.5	434.1
Bolivia	12.3	11.2	12.2	14.0
Brazil	105.8	208.1	364.9	379.9
Colombia	39.5	78.2	99.9	129.1
Cuba	7.7	86.9	86.6	93.0
Chile	20.0	48.0	83.6	91.0
Ecuador	6.0	13.2	19.2	20.4
Mexico	408.5	393.0	421.0	517.5
Paraguay	—	—	—	3.5
Peru	47.5	48.6	63.2	90.0
Trinidad and Tobago	115.0	295.0	385.0	407.0
Uruguay	28.0	28.0	35.0	50.0
Venezuela	520.8	1,003.5	1,199.9	1,280.8
Other	—	—	104.1	132.0
TOTAL *Latin America*	*1,500.2*	*2,451.2*	*3,298.1*	*3,642.3*

SOURCE: *Oil and Gas Journal* (various issues).
[a] 1 cubic metre = 6.29 barrels.

ficiency in respect of petroleum products. The result was an exceptionally vigorous drive to construct refineries, in some cases with very low production capacity and perhaps very high costs.

Although crude oil is usually cheaper to import than most of its derivatives, the advantages of this procedure are contingent upon the volume and structure of consumption in each country.

In order to take advantage of economies of scale in refining, the majority of the Latin American countries would need an external market in addition to their own, since domestic consumption is relatively limited as a rule, and its structure unfavourable.

Some Latin American countries are reaching the stage at which they can carry import substitution no farther as regards petroleum products. If home consumption of these is compared with domestic production, the latter will be seen to meet requirements almost entirely in a great many cases. But even countries like Argentina and Brazil, whose refining capacities are the next highest to Venezuela's and Mexico's, are still dependent upon imports for certain products, such as liquid gas in Argentina's case and aviation spirit, jet fuel and liquid gas in Brazil's.

Mere mention of refinery capacity will not suffice to give an adequate idea of the development of refining. In the first place, as will be seen shortly, there are differences in the degree of utilization of refining capacity. Again, while Latin America possesses about 20 per cent of world capacity for crude oil processing (excluding that of the United States, Canada and the socialist countries), its share in thermal cracking capacity is in the neighbourhood of 40 per cent. But where special processes are concerned, refining in the region has made very little headway; with the exception of Colombia, the percentage represented by catalytic cracking and reforming is very low.

The volume of crude processed (see table 14) increases at much the same rate as refining capacity, for, generally speaking, the level of utilization of this capacity is high. In 1955-1965 the volume in question more than doubled, although lower growth rates were recorded in the last few years of the period.

The average coefficient of utilization of refining capacity in the region, which was 82 per cent in 1955, climbed steadily in subsequent years until by 1966 it had reached 92 per cent (see table 15). The lowest utilization coefficients were found in Bolivia and Chile, where they averaged less than 65 per cent of capacity. In the other countries they ranged from 80 to 97 per cent, depending largely upon domestic and foreign market fluctuations. The influence of the external market was particularly strong in the case of net exporters of petroleum products, like Trinidad and Tobago and Venezuela.

Table 14

LATIN AMERICA: VALUE OF CRUDE PROCESSED, 1955, 1960, 1965 AND 1966

(Thousands of cubic metres)

Country	*1955*	*1960*	*1965*	*1966*
Argentina	9,537	13,627	19,495	20,584
Bolivia	338	359	512	552
Brazil	4,089	10,412	17,841	20,035
Colombia	2,248	4,221	5,325	5,657
Cuba	574	3,736	4,400	4,500[a]
Chile	753	1,727	2,746	3,405
Ecuador	319	674	873	917
Mexico	13,028	17,028	21,444	20,963
Peru	2,356	2,637	3,396	3,413
Trinidad and Tobago	6,130	13,092	21,806	22,927
Uruguay	1,302	1,508	1,867	1,829
Venezuela	31,140	51,339	68,210	68,107
TOTAL *Latin America*	*71,814*	*120,360*	*167,915*	*172,889*

SOURCE: ECLA, on the basis of official statistics.
[a] Estimates.

Table 15

LATIN AMERICA: COEFFICIENT OF UTILIZATION OF REFINING CAPACITY, 1955, 1960, 1965 AND 1966

(Percentages)

Country	*1955*	*1960*	*1965*	*1966*
Argentina	86.9	98.9	79.3	81.0
Bolivia	47.3	55.2	72.3	65.3
Brazil	66.6	86.2	84.3	93.1
Colombia	98.1	93.0	91.8	75.4
Cuba	77.9	74.1	87.5	95.5
Chile	64.9	62.0	56.6	64.4
Ecuador	91.7	88.0	78.3	...
Mexico	55.0	74.7	87.8	91.7
Peru	85.5	93.5	90.0	92.4
Trinidad and Tobago	91.8	76.5	97.6	101.4
Uruguay	80.1	92.8	91.9	82.2
Venezuela	103.0	88.2	98.0	96.8
TOTAL *Latin America*[a]	*82.4*	*84.6*	*90.5*	*92.2*

SOURCE: ECLA, on the basis of official statistics.
[a] Excluding Paraguay and the Central American countries for want of data on the volume of crude processed.

If crude oil production in the 1960s is related to amount of crude processed, in countries which are both producers and net importers, it will be noted that in Argentina the share of domestic crude steadily increased, rising from approximately 50 per cent in 1955 to about 75 per cent in 1960 and 90 per cent in 1967. In Brazil, domestic crude represented roughly 34 per cent of the total refined in 1955, while by 1967 it contributed around 40 per cent. In Chile the proportion corresponding to domestically produced crude shot up from 50 to 75 per cent between 1955 and 1965, but declined in 1966-1967.

In these more recent years, refining in Venezuela, which had more than doubled between 1955 and 1965, ceased to make headway. A similar trend, characterized by a spurt of growth at the outset, and relative stagnation at a later stage, is observable in Colombia, Ecuador and Trinidad and Tobago.

Internal marketing of petroleum products is the longest-established and best-developed sector of the petroleum economy in Latin America. It has displayed the requisite ability to adapt itself to consumer demand and even to achieve a reasonable degree of improvement.

The data available on transport in Latin America's petroleum sector are unreliable and incomplete. Only those relating to oil and gas pipelines are relatively significant. More or less the same may be said of the tanker fleet, with the limitations attaching to the evaluation of maritime transport in general (flags, port facilities, etc.). To assess transport of crude oil and petroleum products by rail and road, important though these generally are in certain areas and for some items, is virtually impossible, owing to the lack of satisfactory statistics.

The data obtainable on the extent of Latin America's oil and gas pipeline networks and on the evolution of the region's tanker fleet are presented in tables 16 and 17.

Table 16

LATIN AMERICA: MAIN OIL AND GAS PIPELINES IN OPERATION, AND PROJECTS AT ADVANCED STAGES, BY 1963

Country	*Diameter (inches)*	*Length (kilometres)*	*Capacity (cubic metres daily)*
Argentina			
Oil pipelines			
Campo Durán–San Lorenzo	12¾	1,480	9,222
Plaza Huincul–Bahía Blanca	14	625	8,500
Mendoza–Córdova (multipurpose pipelines)	14	650	...
Gas pipelines			
Campo Durán–Buenos Aires	22 and 24	1,740	7,100,000
Comodoro Rivadavia–Buenos Aires	10¾	1,680	...
Plaza Huincul–General Conesa	8	462	...
Del Sur (Pico Truncado–Buenos Aires)	700 mm	1,680	10^6
Bolivia			
Oil pipelines			
Sicasica–Arica (crude)	10¾-8⅝	347	1,113
Cochabamba–Sicasica–La Paz (petroleum products)	6⅝	393	1,272
Lamboyo–Sucre (crude)	4½	82	636
Camiri–Cochabamba (crude)	6⅝	533	2,067
Camiri–Santa Cruz (petroleum products)	4½	266	636
Camiri–Pocitos (crude)	6⅝	257	636
Santa Cruz–Arica	8-10	1,100	4,200
Gas pipelines			
Argentine frontier (under construction)		600	
Brazil			
Oil pipeline			
Rio–Belo Horizonte	...	365	45,000 b/d
Colombia			
Oil pipelines			
El Centro–Mamonal	10 and 12	535	3,180
Difícil–Plato	6	50	3,975
Tubú–Coveñas	12¾-10¾	407	3,657-5,088
Orito–Tumaco	457 mm	308	First stage 50,000 b/d to 100,000 b/d through installation of new pumping stations
Río Zulia–Sta. María	10	498	...
Velásquez 26–Galán	12	181	...
Salgar–Armenia (multipurpose pipeline)	215 mm	240	19,600 b/d
Jumbo–Cartago (multipurpose pipeline)	6⅝	145	...

Table 16 (*continued*)

Country	*Diameter (inches)*	*Length (kilometres)*	*Capacity (cubic metres daily)*
Colombia (continued)			
Gas pipelines			
Cicuco–Barranquilla	10¾	225	141,500
Jobo–Mamonal	10	200	...
Costa Rica			
Puerto Limón–San José (multipurpose pipeline)	203 mm	140	...
Chile			
Oil pipeline			
Concepción–San Fernando (multipurpose pipeline)	...	350	...
Gas pipeline			
Punta Arenas	...	200	...
Mexico			
Oil pipelines			
Poza Rica–Atzcapotzalco	10 and 12	236	8,745
Poza Rica–Atzcapotzalco	18	237	14,310
Poza Rica–Salamanca	12	448	6,360
Naranjos–Madero (3 lines)	8	323	8,999
Cerro Azul–Madero	10 and 12	130	6,042
Cacalilao–Madero	14	47	3,975
Pemex–Minatitlán	10	244	3,180
Gas pipelines			
Reynosa–Monterrey	22	248	4,248,000
Monterrey–Chávez	16	309	1,132,800
Chávez–Chihuahua	12	428	453,120
Escobedo–Monclova	10	173	962,880
Brazil–Reinosa (2 lines)	12 and 18	106	2,265,600 and 4,248,000
Alemán–Monterrey	12	170	849,600
Rosita–Laredo	8	183	...
Poza Rica–Atzcapotzalco	20	240	849,600
Venta de Carpio–Salamanca	14	269	2,832,000
Pemex–Venta de Carpio	24	780	7,080,000
Salamanca–Guadalajara (gas pipelines 4,490 kilometres in length)	12¾	256	500 MM/cubic feet–daily
Venezuela			
Oil pipelines			
Temblador–Caripito	30	150	7,949
Travieso–Puerto La Cruz	16	153	27,800
Anaco–Puerto La Cruz (2 lines)	16-26	195	101,500
Oficina–Puerto La Cruz	30	156	74,900
Anaco–Puerto La Cruz (2 lines)	16-26	203	28,618
Guarimito–Pamatacual	16	252	9,540
Silvestre–El Palito	20	337	15,899
Ulé–Amuay No. 1	24-26	230	47,696
Ulé—Amuay No. 2	26	230	34,977
Bachaquero–Puerto Miranda	30-34	107	82,000
Palmarejo de Mara–Punta Cardón	20-30	246	51,670
Casigua–La Solita	8	136	3,840

Table 16 (*continued*)

Country	*Diameter (inches)*	*Length (kilometres)*	*Capacity (cubic metres daily)*
Venezuela (continued)			
Gas pipelines			
Casigua–La Fría	...	120.5	...
Anaco–Caracas	...	327	...
Caracas–Valencia–Morón–Venepal	...	224.5	...
Anaco–Puerto La Cruz–Portigalete	...	107	...
La Paz–Punta Cardón	...	284	...
Guasimito–Caracas	...		
Anaco–Puerto Ordaz (under construction)	20	226	4,000,000
Lago Maracaibo–Aruba (project)	12	240	...

SOURCE: ECLA, on the basis of official statistics.

Table 17

LATIN AMERICA: TANKER FLEETS, 1962-1966

(Thousands of deadweight tons)

Country	*1962*	*1963*	*1964*	*1965*	*1966*
Argentina	760	781	795	704	669
Brazil	545	608	617	612	610
Colombia	22	22	20	20	40
Chile	66	99	117	122	120
Ecuador	2	4	4	4	4
Mexico	180	285	226	242	304
Paraguay	3	3	4	4	4
Peru	63	63	49	49	49
Uruguay	65	65	66	66	66
Venezuela	355	351	283	283	283
TOTAL *Latin America*	*2,061*	*2,281*	*2,181*	*2,106*	*2,149*
WORLD TOTAL	*70,353*	*74,982*	*81,619*	*90,077*	*97,106*

SOURCE: ECLA, on the basis of direct information.

(c) *Intra- and extra-regional trade. Effect on the balance of payments*

The subject of Latin America's overseas trade in petroleum may be approached from two different standpoints: the role played by the region in the world scene, and the scale on which the petroleum industry is geared to intra-regional and to extra-regional markets.

Furthermore, at the national level, a distinction must be drawn between those countries which can barely satisfy their own needs or have to resort to imports to fill a gap, and those which are self-sufficient and/or are (or used to be) traditional exporters. The position of countries in such a classification is liable to alter in the course of time, in consequence of exploration results, fluctuations in production, changes in refining capacity and variations in the structure of demand. Tables 18 and 19 give an idea of the changes noted in the different countries between 1958 and 1966.

Venezuela is by far the biggest exporter of petroleum and petroleum products in Latin America. In 1966 it accounted for 84 per cent of the net total for the region, Trinidad and Tobago and Colombia coming next with contributions of 10 and 3 per cent respectively. Colombia exports mainly to Trinidad and Tobago and the United States. The output of Trinidad and Tobago is supplemented by large-scale imports, which enable it to export about 370,000 barrels of crude oil and petroleum products daily. Mexico manages to export a small quantity after meeting its own requirements with domestic production. Ecuador and Peru, which were net exporters up to 1958, have become net importers. But the situation in these two countries may change over the medium term, as will be shown in the context of reserves and production. The same sections contain an analysis of the case of Argentina, which substantially reduced its imports of crude

Table 18

LATIN AMERICA: EXPORTS OF CRUDE PETROLEUM AND MAIN PETROLEUM PRODUCTS, BY COUNTRIES, 1958, 1962 AND 1966

(Thousands of cubic metres)

Country	*1958*		*1962*		*1966*	
	Crude petroleum	*Petroleum products*	*Crude petroleum*	*Petroleum products*	*Crude petroleum*	*Petroleum products*
Argentina	—	—	299	784	4	1,293
Bolivia	191	27	75	82	330	24
Brazil	1,318	192	347	86	—	—
Colombia	3,776	671	3,865	619	5,686	982
Ecuador	111	—	41	—	69	—
Mexico	127	1,799	1,173	1,819	1,619	1,236
Peru	382	440	438	262	332	96
Trinidad and Tobago[a]	...	...	1,087	16,022	1,870	19,761
Venezuela	109,340	29,551	128,857	42,725	131,335	48,951
TOTAL *Latin America*[a]	*115,245*	*32,680*	*136,182*	*62,399*	*141,245*	*73,343*

SOURCE: ECLA, on the basis of official statistics.

[a] Figures include imports of crude petroleum by Trinidad and Tobago for export in refined forms (5,145 thousands of cubic metres of crude petroleum in 1962 and 10,653 thousands of cubic metres in 1966).

Table 19

LATIN AMERICA: IMPORTS OF CRUDE PETROLEUM AND MAIN PETROLEUM PRODUCTS, BY COUNTRIES, 1958, 1962 AND 1966

(Thousands of cubic metres)

Country	*1958*		*1962*		*1966*	
	Crude petroleum	*Petroleum products*	*Crude petroleum*	*Petroleum products*	*Crude petroleum*	*Petroleum products*
Argentina	7,555	2,716	1,239	1,760	4,124	932
Bolivia	1	135	17	64	—	15
Brazil	6,670	4,868	11,986	1,455	13,199	949
Colombia	—	96	—	23	—	14
Costa Rica	—	181	—	222	21	315
Chile	410	999	686	800	1,417	962
Ecuador	—	135	239	17	575	15
El Salvador	—	218	—	253	493	13
Guatemala	—	470	—	553	412	34
Haiti	—	103	—	106	—	155[a]
Honduras	—	329	—	254	—	363
Jamaica	...	...	—	925	1,474	165
Mexico	113	1,343	—	252	—	1,202
Nicaragua	—	230	20	226	230	42
Panama	—	366	1,230	414	3,229	21
Paraguay	—	95	—	143	46	141
Peru	—	234	—	611	149	1,060
Dominican Republic	—	365	—	431	—	649
Trinidad and Tobago	...	...	10,269	22	14,805	76
Uruguay	1,291	145	1,721	96	1,834	37[a]
Venezuela	—	—	—	—	—	—
TOTAL *Latin America*	*16,040*	*13,028*	*27,407*	*8,627*	*42,008*	*7,060*

SOURCE: ECLA, on the basis of official statistics.

[a] Estimates based on export data of Venezuela and Curaçao and other countries, for want of data on imports.

oil and petroleum products in the decade under review, and may become self-sufficient. Brazil and Chile are noteworthy for the mass substitution of imports of crude oil for those of petroleum products. Bolivia is still a net exporter on a relatively small scale. All the other countries have been net importers of crude or derivatives, and generally of both, in recent years.

Obviously, as regards petroleum exports, Latin America's world market role depends primarily upon the position of Venezuela. As pointed out above, production costs are relatively high in Venezuela, mainly because productivity per well is low by the standards of the other major producing regions. As the latter have gradually stepped up their exports and improved their market status, Venezuela's share in the world market has dwindled. In 1955, for example, of the total amount of petroleum traded in world markets, 30 per cent came from Venezuela; by 1966 this proportion had dropped to about 16 per cent. Although Venezuelan oil continues to enjoy specific locational advantages, they have been lessened by the marked decrease in tanker freight rates during the 1960s, which has also meant that keener competition has had to be faced, even in those consumer centres whose proximity to Venezuela makes them natural markets for its petroleum. Evidence is to be found in the increasing quantities imported by such countries as Argentina, Brazil and Uruguay from the Middle East, Africa and the Soviet Union instead of from Venezuela.

Not only has Venezuela's competitive position deteriorated in respect of its crude petroleum, but its refined products have also found it more and more difficult to maintain their foothold in world markets. Demand for them has slackened as a result of the large-scale expansion of refining capacity effected during the period under review, especially in consumer areas.

Imports of crude have increased in volume while those of petroleum products have declined (see table 19). Among the big importers; Argentina has been importing less and less crude, a trend which sharpened in 1967. Imports of petroleum products have virtually been reduced to purchases of liquid gas and gas oil; the former, have shown a rising trend in recent years, and the latter, marked fluctuations.

The biggest market in Latin America for imports of crude is Brazil. Its external purchases are increasing, and despite the considerable expansion of domestic production, it may be expected to continue buying in the world market at least on approximately the same scale as in 1963-1968. There may be a swing in the direction of self-sufficiency over the medium or long term, but reliable data are not yet available on which to base an evaluation of orders of magnitude. In 1964-1968 imports of petroleum products were confined to liquid gas, aviation spirit and jet fuel. The appreciable decline in the volumes of aviation spirit imported reflects the technical progress of air transport. Imports of jet fuel, on the other hand, expanded because of these advances, inasmuch as the expansion of domestic production did not keep pace with the new requirements. Imports of liquid gas show a downward trend, largely as a result of the importation of butanized crudes, which boosted liquid gas yields in Brazilian refineries.

Mexico's external purchases of petroleum and petroleum products were practically reduced to imports of liquid gas, which, after decreasing from 1956 to 1960, climbed steadily from the latter year onwards.

In the other net importer countries, imports of petroleum products were predominant up to the end of the 1950s, since then the import substitution process has been progressively gaining ground.

The effect of the foregoing trends on regional totals was practically to treble imports of crude between 1958 and 1966 and approximately halve those of petroleum products.

There was a significant upswing in Latin America's extra-regional imports of crude oil in the 1960s (see table 20). The trend is most clearly-marked, of course, in the case of net importers and non-producers of crude, with their larger purchases from the Middle East, Africa and the Soviet Union, but it is also apparent in other countries, such as Trinidad and Tobago, for example, which undertakes refining for export.

In imports of derivatives, too, the share of purchases from outside the region increased, as can be seen in table 21.

It was in the countries that are net self-suppliers or both producers and importers that the drop in intra-regional imports of petroleum products was most striking. It should also be noted that with the exception of Cuba non-producers of crude did not possess refineries, generally speaking, until 1962; or, in other words, in these countries taken as a group,

Table 20

SHARE OF INTRA-REGIONAL IMPORTS OF CRUDE PETROLEUM IN LATIN AMERICA'S TOTAL IMPORTS 1950, 1955, 1960, 1965 AND 1966

(Thousands of cubic metres, and percentages)

Year	*Imports of crude (excluding Aruba and Curaçao)*			*Exports of crude (including Aruba and Curaçao)*		
	Total (1)	*Intra-regional (2)*	*Percentage (2)/(1)*	*Total (3)*	*Intra-regional (4)*	*Percentage (4)/(3)*
1950	6,272	4,615	73.6	49,829	48,172	96.7
1955	13,624	8,985	65.9	57,506	52,867	91.9
1960	22,999	15,085	65.6	63,882	55,968	87.6
1965	44,087	27,165	61.6	88,179	71,257	80.8
1966	46,599	22,791	48.9	89,705	65,897	73.5

SOURCE: ECLA, on the basis of official statistics.

Table 21

LATIN AMERICA:[a] SHARE OF EXTRA-REGIONAL IMPORTS OF PETROLEUM PRODUCTS IN LATIN AMERICA'S TOTAL IMPORTS, 1945, 1950, 1955, 1960 AND 1965

(Thousands of cubic metres, and percentages as indicated)

Imports	*1945*	*1950*	*1955*	*1960*	*1965*
Liquid gas					
Total (1)	—	30	58	432	1,516
Extra-regional (2)	—	30	54	174	970
Percentage (2)/(1)	—	100.0	93.1	40.3	64.0
Gasolines					
Total	1,030	3,855	3,882	2,883	1,200
Extra-regional	169	646	982	586	24
Percentage	16.4	16.8	25.3	20.7	2.0
Kerosene					
Total	138	451	1,548	1,094	559
Extra-regional	20	36	426	97	2
Percentage	14.5	8.0	27.5	8.8	0.4
Gas oil and diesel oil					
Total	554	1,023	2,790	3,025	1,359
Extra-regional	82	83	712	554	678
Percentage	14.8	8.1	25.5	18.3	49.9
Fuel oil					
Total	5,070	7,235	7,022	4,880	2,036
Extra-regional	278	559	1,190	425	326
Percentage	5.5	7.7	16.9	8.7	16.0
Totals					
Total	6,792	12,594	15,300	12,264	6,670
Extra-regional total	549	1,354	3,364	1,836	2,000
Percentages	8.1	10.8	22.0	15.0	30.0

SOURCE: ECLA, on the basis of official foreign trade statistics.

[a] Excluding Cuba for want of data.

refining was just starting in or around that year.

Of the total crude petroleum imports of the Latin American countries (excluding Aruba and Curaçao), the proportion represented by purchases from the region itself fell from some 66 per cent in 1955 to about 50 per cent in 1966; for petroleum products, the corresponding decrease was from approximately 80 per cent to 70 per cent. In extra-regional imports the biggest increment was shown by liquid gas. In the case of other refined products, as has already been pointed out, a vigorous drive was made to substitute domestic production for imports.

Table 22 gives some idea of the significance of Latin America's international petroleum trade in terms of value. The year 1965 was selected as being the latest for which fairly complete data are available. This table reveals the flight of foreign exchange implied for the region by the trends indicated.

In some countries—for example, Argentina Brazil and Uruguay—imports of crude petroleum and petroleum products constituted a heavy burden on the balance of payments in the 1960s. (See table 23.)

In contrast, sales of crude and derivatives accounted for almost the whole of Venezuela's export trade, and were also a valuable source of foreign exchange for Colombia and, to a much lesser extent, Bolivia.

For Latin America in the aggregate, the value of exports of crude oil and petroleum products decreased between 1958 and 1966 mainly as a result of the fall in world market prices.

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LATIN AMERICA: INTERNATIONAL TRADE

Imports c.i.f

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Country	*Crude petroleum*						*Im*
	Imports from:			*Exports to:*			
	Latin America	*Other areas*	*Total*	*Latin America*	*Other areas*	*Total*	*Latin America*
Argentina	20,746	41,640	62,386	—	—	—	10,630
Bolivia	—	—	—	689	—	689	798
Brazil	68,061	88,380	156,441	—	—	—	14,050
Colombia	—	—	—	2,095	86,074	88,169	11
Costa Rica	—	—	—	—	—	—	3,045
Chile	11,439	4,878	16,317	—	—	—	3,447
Ecuador	10,249	—	10,249	2,118	—	2,118	—
El Salvador	7,690	91	7,781	—	—	—	400
Guatemala	6,071	98	6,169[b]	—	—	—	3,051
Haiti	...	...	...	...	...	...	...
Honduras	55	806	861[b]	—	—	—	238
Jamaica	2,779	243	3,022[b]	—	—	—	41
Mexico	—	2	2	—	13,997	13,997	—
Nicaragua	4,142	895	5,037[b]	—	—	—	26
Panama	4,841	—	40,841[b]	—	—	—	36
Paraguay	—	—	—	—	—	—	1,754
Peru	906	8	914	2,633	3,378	6,011	4,936
Dominican Republic[g]	1,563[h]	2,613[h]	4,176[h]	—	—	—	224
Uruguay	12,121	8,228	20,349	—	—	—	898
Venezuela[g]	—	—	—	176,261	1,761,808	1,938,069	—
TOTAL *Latin America*	*186,663*	*147,882*	*334,545*	*183,796*	*1,865,257*	*2,049,053*	*43,585*

SOURCE: Foreign trade yearbooks for 1965, except in the case of Colombia, for which import data obtained from IBM lists and export figures from Departamento Administrativo Nacional de Estadís (DANE), *Boletín mensual de estadística*, No. 181 (April 1966) (exports of staple items, by seller countri

[a] Including fuel oil, gas oil/diesel oil, kerosene/jet fuel, gasolines and liquid gas/naphtha/combus gas, natural gas, combustion oil/fuels (naphthas, gasolines, etc.).

[b] Including partly refined petroleum.

The net value of imports appreciably de-
ined. The data presented in table 24 shows
reduction of roughly 117 million dollars in
e net balance of the countries considered,
cluding Venezuela, between 1958 and 1966.
his is an eloquent figure since, as was stated
earlier paragraphs, imports of crude increased
ıbstantially in volume.

The decrease in the value of imports is
rongly influenced by Argentina, whose net
ıports of petroleum and petroleum products,
terms of value, sank from 211 million dollars
1958 to 80 million in 1966.

Peru, which changed from a net exporter
a net importer in the 1960s, was an excep-
on to the general rule. All the traditional net
ıporters recorded lower values for their pur-
ıases of crude oil and refined products.

It should not be forgotten that such reductions reflect not only the replacement of imports of petroleum products by those of crude oil, but also the decline in world petroleum prices in the period under consideration.

(d) *International and internal prices*

(i) *International prices.* World market prices of petroleum and petroleum products have evolved over the long term in relation to a basing point. Little by little, in the course of time the centre of gravity has shifted, mainly as a result of the growing competition put up by the Middle East in the international market.

Except in 1956-1958, when the blockage of the Suez Canal pushed up prices considerably, posted prices underwent successive reductions, both in the case of the Middle East and in that of Venezuela. This provoked a

DE PETROLEUM AND PETROLEUM PRODUCTS, 1965

rts f.o.b.

lollars)

	Petroleum products[a]						Lubricants				
		Exports to:			Imports from:			Exports to:			
r s	Total	Latin America	Other areas	Total	Latin America	Other areas	Total	Latin America	Other areas	Total	
35	29,815	2,059	6,802	8,861	3,480	5,124	8,604	1	—	1	
53	861	53	—	53	39	230	269	—	—	—	
51	25,501	—	—	—	—	74	74	7	—	7	
14	725	2,646	5,134	7,780	29	1,750	1,779	...	...	...	
16	6,561	—	—	—	20	1,542	1,562	—	—	—	
14	5,461	—	—	—	602	4,764	5,366	—	—	—	
00	900	—	—	—	3	1,599	1,602	—	—	—	
55	1,065	3,684	—	3,684	14	1,027	1,041	1	—	1	
25	6,376	6	—	6[c]	5	1,997	2,002	—	—	—	
.	...	...	...	...	...	...	...	...	...	...	
54[d]	4,902	—	—	—	—	874[e]	874	—	—	—	
99	240	252	478	730	—	176	176	118	81	199	
03	19,303	358	25,342	25,700	—	2,518	2,518	18	78	96	
30	1,106	7	16	23[c]	12	1,202	1,214	—	—	—	
04	740	16	23,695	23,711[c]	1	1,283	1,284	—	—	—	
29	3,483	—	—	—	8	526	534	—	—	—	
18	12,854	1,599	211	1,810	285	3,214	3,499	226	20[f]	246	
52	2,686	—	—	—	—	1,242	1,242	—	—	—	
25	1,423	—	—	—	12	1,123	1,135	—	—	—	
45	45	47,443	745,305	792,748	—	912	912	2,794	9,404	12,198	
52	*124,047*	*58,123*	*806,983*	*865,106*	*4,510*	*31,177*	*35,687*	*3,165*	*9,583*	*12,748*	

[c] Including lubricants.
[d] Including imports to a value of 8,000 dollars from "Other countries" not specified.
[e] Including imports to a value of 15,000 dollars from "Other countries" not specified.
[f] Including ships' consumption (20,000 dollars).
[g] Imports f.o.b.
[h] Corresponding to "crude oil for fuel".

Table 23

LATIN AMERICA (SELECTED COUNTRIES): SHARE OF CRUDE PETROLEUM AND PETROLEUM PRODUCTS IN TOTAL VALUE OF IMPORTS AND EXPORTS, 1958, 1962 AND 1966

(Millions of dollars and percentages)

Country	1958			1962			1966		
	Crude petroleum and petroleum products	*Total*	*Percentage*	*Crude petroleum and petroleum products*	*Total*	*Percentage*	*Crude petroleum and petroleum products*	*Total*	*Percentage*
				Imports					
Argentina	210.9	1,232.6	17.1	135.9[a]	1,356.5	10.0	93.2	1,124.0	8.3
Brazil	281.2	1,352.4	20.8	242.6	1,475.0	16.4	276.1	1,496.2	18.5
Chile	37.4	414.5	9.0	29.5	511.6	4.8	34.3	755.3	4.5
Ecuador	3.1	103.5	3.0	3.6	97.1	3.7	8.9	171.9	5.2
Mexico	40.7[b]	1,128.6	3.6	17.0[b]	1,143.0	1.5	35.5[b]	1,606.4	2.2
Paraguay	2.9[c]	26.2[c]	11.1	3.5	34.7	10.1	4.5	50.2	9.0
Peru	11.9	382.7	3.1	16.7	534.3	3.1	27.2	816.6	3.5
Uruguay	37.4	143.1	26.1	30.3	228.6	13.5	31.7	164.2	19.3
TOTAL[d]	*626.5*	*3,783.6*	*16.6*	*479.1*	*5,380.8*	*8.9*	*511.4*	*6,184.8*	*8.3*
				Exports					
Bolivia	5.1	50.1	10.2	1.4	58.9	2.4	6.6	126.2	5.2
Colombia	76.7	460.7	16.6	68.8	463.3	14.8	81.4	507.6	16.0
Ecuador	0.8	135.3	0.6	1.0	142.8	0.7	1.3	192.2	0.7
Mexico	30.1[b]	732.4	4.1	38.9[b]	929.3	4.2	39.6[b]	1,193.3	3.3
Peru	15.7	283.6	5.5	13.5	539.8	2.5	7.7	765.4	1.0
Venezuela	2,297.5	2,321.4	99.0	2,342.9	2,593.6	90.3	2,214.8	2,374.0	93.3
TOTAL[d]	*2,425.9*	*3,983.5*	*60.9*	*2,466.5*	*4,727.7*	*52.2*	*2,351.4*	*5,158.7*	*45.6*

SOURCE: ECLA, on the basis of official statistics.

[a] Including $54.1 million of bituminous shale oil.

[b] Including natural gas.

[c] 1959.

[d] These totals account for over 95 per cent of the grand total for Latin America.

Table 24

LATIN AMERICA (SELECTED COUNTRIES): BALANCE OF OVERSEAS TRADE IN PETROLEUM AND PETROLEUM PRODUCTS, 1958 AND 1966

(Millions of dollars)

Country	1958			1966		
	Exports	*Imports*	*Balance*	*Exports*	*Imports*	*Balance*
Argentina	—	211	—211	13	93	—80
Bolivia	5	—	+5	7	2	+5
Brazil	26	281	—255	—	276	—276
Colombia	77	4	+73	81	—	+81
Chile	—	37	—37	—	34	—34
Ecuador	1	3	—2	1	9	—8
Mexico	30	41	—11	40	35	—5
Peru	16	12	+4	8	27	—19
Uruguay	—	37	—37	—	32	—32
Venezuela	2,297	—	+2,297	2,215	—	+2,215
TOTAL	*2,452*	*626*	*+1,826*	*2,365*	*508*	*+1,857*
TOTAL *excluding Venezuela*	*155*	*626*	*—471*	*150*	*508*	*—354*

SOURCE: ECLA, on the basis of official statistics.

reaction on the part of the governments of the producer countries, as a result of which posted prices were stabilized in the later years of the period.

Discounts on posted prices became much more frequent, however, and today there is a clear distinction between posted prices and the prices at which the products concerned are actually sold.

During the 1960s the stepping-up of exploration activities and the discovery of large petroleum reserves in various parts of the world—with the accompanying emergence of both independent and State oil companies—has led to a marked expansion of supply, which in its turn has helped to stimulate competition and to weaken the selling prices of crude oil and refined products. Furthermore, the prices in question are characterized by a high degree of heterogeneity; competition tends to be brisker in centres where the expansion of per capita consumption and/or refining capacity is in full swing, and where there is generally a measure of flexibility in the selection of crude petroleum and petroleum products. Moreover, prices are affected by the existence of many different types of crude, suitable for different uses. Venezuelan heavy crude yields 70 per cent of residual fuel oil, while the main product of the light crude from Kuwait is gasoline (42 per cent). Obviously, the choice of one type of crude or another will depend upon the structure and complexity of the importers' refining activities and consumption, as well as on the price.

It must further be added that in more recent years transactions in petroleum and petroleum products have generally been negotiated on the basis of highly individual bilateral contracts, in which prices are largely contingent upon quantities, duration and terms of payment.

The over-all trend of actual selling prices, however, has turned steeply downwards since 1958, as can be seen from table 25, which assembles data on some of the leading world importers of petroleum.

Table 25

AVERAGE F.O.B. PRICES OF CRUDES EXPORTED TO SELECTED COUNTRIES FROM VENEZUELA AND THE MIDDLE EAST, 1958-1965

(Dollars per barrel)

Year	*To United Kingdom[a] from*		*To Federal Republic of Germany[a] from*		*To United States from*		*To Brazil[a] from*	
	Venezuela	*Middle East* [b]	*Venezuela*	*Middle East* [c]	*Venezuela*	*Middle East* [d]	*Venezuela*	*Middle East* [e]
1958	2.75	1.92	2.49	2.21	2.63	2.42	2.39	1.64
1959	2.49	1.76	2.50	1.84	2.40	2.09	2.27	1.57
1960	2.32	1.67	2.18	1.72	2.37	2.11	2.19	1.32
1961	2.24	1.64	2.00	1.58	2.37	2.05	1.92	1.13
1962	2.23	1.64	1.79	1.53	2.38	1.90	1.87	1.11
1963	2.17	1.64	1.74	1.50	2.36	2.00	1.83	1.18
1964	2.17	1.67	1.67	1.46	2.35	1.99	1.80	1.19
1965	1.97	1.53	1.52	1.25	2.31	2.05	1.79	1.21
Decrease in absolute terms 1958-1965	0.78	0.39	0.97	0.96	0.32	0.37	0.60	0.43[f]
Decrease in relative terms (percentages) 1958-1965	28.4	20.3	39.05	43.4	12.2	15.3	25.1	26.2[f]

SOURCE: Banco Central de Venezuela, Department of Economic Research.

[a] Average f.o.b. price calculated on the basis of average c.i.f. price minus estimated freight rate (Intascale tariff less discount).

[b] Average f.o.b. price for shipments from Kuwait (major Middle East supplier) to the United Kingdom.

[c] Average f.o.b. price for shipments from Iran (major Middle East supplier) to the Federal Republic of Germany.

[d] Average f.o.b. price for shipments from Saudi Arabia (major Middle East supplier) to the United States.

[e] Average f.o.b. price for shipments from the Middle East to Brazil (no data are available for exports from the Middle East by countries of origin).

[f] Decrease between 1958 and 1964.

This downturn reflects not merely the granting of bigger and bigger discounts on posted prices, but also the progressive reduction of tanker freight rates, which has been particularly advantageous to petroleum from the Middle East, as was mentioned in the section on foreign trade.

Prices of refined product have evolved along much the same lines as those of crudes. The rapid expansion of the refining industry in consumer countries has affected them to an increasing extent.

The progressive reduction of f.o.b. export prices and the prolonged downward movement of freight rates have operated in favour of consumer countries and, of course, against the interests of exporters.

Both these phenomena are strongly marked in Latin America.

Tables 26 and 27, respectively, show average real prices for the two leading Latin American exporters: Venezuela and Colombia.

In Venezuela's case, prices of crudes dropped sharply from 2.19 dollars per barrel in 1959 to 1.88 dollars in 1966 (a reduction of 0.31 dollar per barrel). The weighted price for refined products in the aggregate fell from 2.46 dollars in 1959 to 1.81 in 1966 (a reduction of 0.65 dollar per barrel). Thus the weighted total for Venezuela's exports of crude petroleum and petroleum products shows a decrease of 0.31 dollar per barrel. It should be noted that the comparisons are based on the figures for the year after the Suez crisis. The deterioration would be much greater if the year 1957 were taken (see table 26).

Actual selling prices for crude from Colombia have apparently been more stable; between 1958 and 1965 the reduction was 0.29 dollar. Since 1961, fluctuations in Colombia's average export prices have remained within a range of 2.48 to 2.44 dollars per barrel (see table 27 below).

It is of interest to note that as a general rule average prices are higher for Colombian crudes than for the Venezuelan products.

Table 26

VENEZUELA: AVERAGE PRICES ACTUALLY OBTAINED FOR EXPORTS OF CRUDE PETROLEUM AND PETROLEUM PRODUCTS,[a] 1950-1966

Year	*Crude*		*Petroleum products*		*Total petroleum exports*[b]	
	Dollars per barrel	*Index (1955 = 100)*	*Dollars per barrel*	*Index (1955 = 100)*	*Dollars per barrel*	*Index (1955 = 100)*
1966	1.88	81	1.81	70	1.86	78
1965[c]	1.90	82	1.92	75	1.91	81
1964	1.91	82	1.97	77	1.93	81
1963	2.02	87	2.10	82	2.04	86
1962	2.06	89	2.16	84	2.09	88
1961	2.12	91	2.25	88	2.15	91
1960	2.11	91	2.27	88	2.15	91
1959	2.19	94	2.46	96	2.25	95
1958	2.48	107	2.74	107	2.54	107
1957	2.59	112	3.00	117	2.67	113
1956	2.33	100	2.66	104	2.40	101
1955	2.32	100	2.57	100	2.37	100
1954	2.35	101	2.46	96	2.37	100
1953	2.32	100	2.45	95	2.35	99
1952	2.13	92	2.44	95	2.18	92
1951	2.03	88	2.41	94	2.09	88
1950	2.07	89	2.21	86	2.09	88

SOURCE: Banco Central de Venezuela, Department of Economic Research, Petroleum and Mining Economy Section.

[a] The average price of crude petroleum and petroleum products was calculated on the basis of tables of total exports and total income, published by the Ministry of Mines and Hydrocarbons. The price series from 1955 to 1965 was obtained by linking the price index (1962 = 100) at 1962 to the price declared by the 1962 Co-ordinating Commission, which is the latest price noted by that body.

[b] In obtaining the total for petroleum, the average prices actually obtained for crude petroleum and petroleum products were weighted by their respective export volumes for each year.

[c] Adjusted figures.

Table 27

COLOMBIA: AVERAGE F.O.B. PRICES ACTUALLY OBTAINED FOR EXPORTS OF CRUDE PETROLEUM, 1959-1964

(Dollars per barrel)

Year	*Price*
1959	2.57
1960	2.55
1961	2.48
1962	2.49
1963	2.48
1964	2.44

SOURCE: ECLA, on the basis of official statistics.

The outstanding importer markets in the 1960s were those of Argentina and Brazil.

The average c.i.f. import price in Argentina was usually relatively high up to 1963 (see table 28). As it stood above 3.0 dollars per barrel between 1960 and 1963, it was presumably based on f.o.b. prices that were fairly close to posted price levels. In 1964, however, it dropped to 2.73 dollars, and in 1965 there was a further reduction, this time to 2.49 dollars per barrel. The tenders submitted in 1965 and 1966 probably had favourable repercussions for Argentina, since the offers made include prices c.i.f. La Plata falling below 2.00 dollars per barrel of crudes from the Middle East.

Broadly speaking, average c.i.f. import prices for the various petroleum products appear to approximate to the corresponding posted prices plus freight.

Brazil is among the major world importers that have reaped most benefit from low c.i.f. import prices. In the decade under review these prices decreased by over 1.00 dollar per barrel in Brazil (see table 29) falling by more than 30 per cent between 1958 and 1966.

Notwithstanding the great distances separating Brazil from the Middle East and from the Soviet Union, c.i.f. import prices are lower for crude petroleum from these areas than for Venezuelan crude.

As regards the future outlook for world prices of petroleum and petroleum products, the downward trend may persist at least throughout the 1970s, in the opinion of eminent international observers and experts.

This forecast is based on the politico-economic and strategic factors operating in normal times. The former relate mainly to the concerted efforts of the exporter countries to establish marketing standards through such bodies as the Organization of Petroleum Exporting Countries (OPEC). While in recent years these efforts have prevented prices from sinking to an even lower ebb, it is thought that it will become more and more difficult for their influence to make itself felt in the future.

Table 28

ARGENTINA: AVERAGE C.I.F. PRICES OF IMPORTS OF CRUDE PETROLEUM, 1959-1965

(Dollars per barrel)

Year	*Total imports*	*Imported by companies*			
		YPF	*ESSO*	*SHELL*	*Compañía General de Combustible*
1965[a]	2.49	...	...	...	...
1964	2.73	2.17	3.37	2.74	3.85
1963	3.21	2.91	3.54	2.88	3.90
1962	3.02	2.63	3.33	2.80	3.71
1961	3.19	3.24	3.21	2.99	3.97
1960	3.08	...	...	...	...
1959	2.92	...	...	...	...

SOURCES: Dirección Nacional de Energía y Combustibles de Argentina, *Anuario Estadístico*; *Platt's Oilgram News Service*, Special Supplement.

[a] First six months.

Table 29

BRAZIL: AVERAGE C.I.F. PRICES[a] OF IMPORTS OF CRUDE PETROLEUM FROM THE MIDDLE EAST, VENEZUELA AND THE SOVIET UNION, 1955-1965

(Dollars per barrel)

Year	*Middle East*	*Venezuela*	*Soviet Union*	*Total*
1965[b]	1.99	2.19	2.02	2.06
1964	2.02	2.23	2.09	2.11
1963	2.12	2.32	2.11	2.21
1962	2.09	2.37	2.10	2.24
1961	2.15	2.44	2.23	2.31
1960	2.40	2.75	2.46	2.54
1959	2.80	2.90	2.83	2.85
1958	3.04	3.11	—	3.09
1957	3.08	3.08	—	3.08
1956	2.88	2.75	—	2.79
1955	2.88	2.75	—	2.80

SOURCE: Petróleo Brasileiro (PETROBRAS).

[a] Imports by PETROBRAS.

[b] Estimates based on incomplete data.

A further decline, should it take place, would reflect the expansion of supply, the reduction of freight rates through the use of supertankers, and the propensity to diversify sources of energy which is to be noted in the major import markets.

(ii) *Internal prices.* The prices of petroleum products and natural gas on the Latin American countries' domestic markets are worth studying for two essential reasons: because they affect the level of capital formation in the petroleum industry itself, and because they reflect the economic, social and regional objectives of energy policy. These aims, however, are not always reasonably consistent, and it often happens that the measures adopted to ensure maximum fulfilment of one of them militate against the achievement of another.

A useful starting point would be to establish historical price series for each country and, in addition, comparisons between them, all in approximately real terms. In relation to Latin America, however, a study of this kind involves highly complex—indeed, virtually insoluble—problems where international comparisons are concerned. The over-all level of prices and the parity exchange rate for the dollar may afford a frame of reference, but in some instances they are misleading.

Broadly speaking, during the 1960s prices of petroleum products in the region rose less than the cost-of-living index, for a variety of reasons, including technical progress, State price controls, and the competition which, as already shown, has been bringing down world market prices.

Even in primarily importer countries like Brazil and Uruguay, whose policy seems to have been to maintain the consumer prices of refined products at a relatively high level, the marked fluctuations to be noted in over-all price levels do not exactly parallel the increases in the prices of petroleum products.

When downward price trends are not the consequence of decreases in the cost of the factors of production or of technical progress quantifiable in economic terms, they have adverse effects on capital formation in the enterprises concerned, as has been demonstrated in some of the Latin American countries in recent years. In such circumstances, the companies' takings are not sufficient to sustain the development of the petroleum sector (which is primarily dependent on internal financing) at a rapid and vigorous pace more consistent with their countries' economic and social expansion objectives.

This situation is most noticeable in some of the countries in which State enterprises predominate, and in which a policy of low prices, or of subsidies (explicit or implicit) to other sectors of the economy, has made it impossible to keep up the requisite rate of capital formation. Critical cases may presumably have arisen which have demanded compensatory Treasury measures, with the ensuing unfavourable repercussions on the over-all economy.

It is by no means in Latin America alone that the petroleum industry depends primarily upon internal sources of financing, for even at the international level the proportion of external funds is only 10-15 per cent. In Western Europe it is estimated at about 5 per cent.

The cost of production of refined petroleum products, which plays a decisive part in price formation, is determined partly by the prices of imported crude or by the cost of producing it at home, and partly by refining costs and structures.

There is an immensely wide range of different situations in Latin America with regard to supplies from abroad and variations in the costs of domestic production of crude and refining. Cases may conceivably occur in which these costs are very high by international standards.

The part played by the State in fixing taxes and prices for petroleum products is reflected in the comparative structure of taxes and prices for the various products in each country (see tables 30 and 31). The price structure is also partly determined by the refining costs assigned to the different products, in which market forces are involved as well as the specific and separable costs of the refining process in each case.

An analysis of the behaviour pattern of demand for petroleum products in Latin America during the 1960s shows that its price-elasticity was slight.

Gasoline affords a case in point. Demand for it is inelastic, and derived from the motor-vehicle industry; since it is also a product in very common use, it combines the requisites for withstanding heavy taxation. Accordingly, in many countries the taxes levied on gasoline are excessively high. In several instances, much of the revenue thus obtained is allocated to the development of road networks, which in turn boosts gasoline consumption.

When such a policy is associated with that of fixing low relative ex-refinery prices, the capital-formation process in petroleum enterprises suffers, since they cannot, out of their own resources, keep the expansion of production abreast of the growth of demand.

Another point to consider is the encouragement of consumption of particular refined products—for example, kerosene—in countries in the Southern Zone of South America. For one reason or another kerosene is regarded as a wage good for which the price fixed should be very low, in terms of calorific power, in relation to that of other petroleum products. It is also virtually exempt from local taxes. This proceeding may appreciably reduce the aggregate ex-refinery value of the products obtained, with the resulting adverse effects on the refining industry.

The foregoing notes make no claim to constitute a detailed analysis of all the distortions in consumption of petroleum products occurring

Table 30

LATIN AMERICA (SELECTED COUNTRIES): SHARE OF TAXES IN THE PRICE OF PETROLEUM PRODUCTS, 1965

(Percentages)

Country	*Ordinary gasoline*	*Kerosene*	*Diesel oil or gas oil*	*Fuel oil*
Argentina	42–53	12–34	29–54	25
Brazil	46	37	37	14
Chile	30	7.5	15.5	10
Colombia	10	2.5	2.5	1.5
Ecuador	40	7	8	3.5
Mexico	14	14	14	14
Paraguay	45	26	23	22
Uruguay	41	10	26	12
Venezuela	10	0.5	1.5	3
Bolivia	16.5	—	...	...
Peru	31	4.5	...	...
United States (average)	50	—	...	—
Selected European countries (average)[a]	67	...	14[a]	29

SOURCE: ECLA, on the basis of various publications.

[a] The average rate varies, however, within very wide limits.

Table 31

LATIN AMERICA (SELECTED COUNTRIES): STRUCTURE OF PRICES EXPRESSED IN RELATION TO FUEL OIL, 1950, 1955, 1960 AND 1965

Country	*Including taxes*				*Excluding taxes*			
	1950	*1955*	*1960*	*1965*	*1950*	*1955*	*1960*	*1965*
I. *Argentina*								
Fuel oil	100	100	100	100	100	100	100	100
Ordinary gasoline (from domestically produced crude)	400	636	300	313	387	324	204	204
Kerosene (from domestically produced crude)	253	386	175	250	307	324	195	245
Diesel oil (from domestically produced crude)	127	125	210	237	120	105	144	188
II. *Brazil*								
Fuel oil	100	100	100	100	100	100	100	100
Gasoline (Type A)	423	611	240	253	332	696	190	161
Kerosene	269	305	222	229	233	302	223	169
Diesel oil	152	185	168	199	155	193	167	146
III. *Uruguay*								
Fuel oil	100	100	100	100	100	100	100	100
Gasoline (standard price)	500	513	351	373	265	235	246	250
Kerosene (for lighting)	241	216	161	202	200	179	152	206
Diesel oil	159	167	164	192	101	119	144	184
IV. *Chile*								
Fuel oil (light)	100	100	100	100	100	100	100	100
81-octane gasoline	361	209	167	154	294	159	128	119
Kerosene	156	120	100	102	155	120	102	104
Diesel oil	156	147	130	135	156	147	121	125
Fuel oil	—	—	89	89	—	—	89	89
V. *Venezuela*								
Fuel oil (heavy)	100	100	100	100	100	100	100	100
Ordinary gasoline	250	341	214	179	226	327	192	159
Kerosene	217	295	186	155	225	325	192	158
Diesel oil	180	245	174	150	182	274	176	151
VI. *Mexico*								
Fuel oil	100	100	100	100	100	100	100	100
Ordinary gasoline	670	460	460	450	670	460	460	450
Kerosene	195	115	160	160	195	115	160	160
Diesel oil	175	120	160	160	175	120	160	160

SOURCE: Direct information supplied by the División de Economía Petrolera de Venezuela.

in the Latin American countries as a result of unsatisfactory internal price-fixing systems. The whole question is, indeed, linked to that of the utilization of other forms of energy; and the way in which the problem presents itself differs greatly not only from one country to another but from one area to another within any given country.

It must be remembered, however, that a rational system of fixing consumer prices may be a highly efficacious means of channelling consumption towards the products best suited to each purpose, and promoting a structure of demand that will enable domestic refineries to maximize their operational efficiency, in economic terms, and/or to keep imports of crude oil and petroleum products down to minimum volumes.

(e) *The public sector in the petroleum industry*

The part played by the public sector in the hydrocarbons industry is multiplex as a general rule, and in the case of Latin America worthy of particular note on a number of counts. For purely methodological reasons of presentation the following classification may be adopted: (*a*) action to establish regulations or controls—including price-fixing—in all branches of the petroleum industry; (*b*) State ownership; (*c*) State financing of petroleum activities, including technical research and training of personnel; and (*d*) planning in general.

In all the Latin American countries, although in differing degrees, the various activities relating to hydrocarbons are subject to State regulations. The principles underlying these regulations are not always the same, but fundamentally they stem from the character of enterprise in this field, and the composition or source of the capital invested in the industry (private, public, domestic, foreign).

Since the amount of domestic private capital that investors have been prepared to risk in prospecting has hitherto been very modest, private enterprise has been chiefly foreign. What is more, the provision of supplies for the importer countries and the management of external markets for the exporter countries' petroleum are mainly in the hands of some few integrated foreign concerns. Hence the contention that clear-cut government action is needed to safeguard national interests.

The policies followed by the different countries with respect to official price-fixing have also been based on other criteria which are discussed in the section dealing with internal and international prices.

In most of the Latin American countries, the lines of thought indicated above are closely linked to the question of State ownership of basic industries.

Attention has already been drawn in earlier sections to the tendency towards increasing self sufficiency in those countries whose petroleum production falls short of their requirements, and to the development of local refining industries in almost all the countries of the region. As domestic private capital is inclined to shun the petroleum sector, either on account of exploration risks or because of the heavy investment incurred at every stage of the industry, an attempt has been made to attain these objectives through State enterprises, although in most cases without precluding the coexistence of private companies. Such combinations of public and private activity would seem to be desirable for exporter (or potentially exporter) countries, seeing how critical is the problem of selling petroleum and petroleum products on a world market where the influence of consortia is strong.

Accordingly, during the 1960s, the expansion of State agencies and enterprises in Latin America continued, in most cases, alongside that of private companies, especially at the refining and distribution stages.

Table 32 shows the evolution of State participation in the petroleum economy between 1962 and 1967.

Table 32

LATIN AMERICA: SHARE OF STATE ENTERPRISES IN CRUDE PETROLEUM PRODUCTION AND REFINING CAPACITY, 1962 AND 1967

(Percentages)

Country	*State enterprise*	*Production*		*Refining*	
		1962	*1967*	*1962*	*1967*
Argentina	Yacimientos Petrolíferos Fiscales (YPF)	99.9	99.3	59.3	60.7
Bolivia	Yacimientos Petrolíferos Fiscales (YPFB)	100.0	22.5	100.0	100.0
Brazil	Petróleo Brasileiro (PETROBRAS)	100.0	100.0	81.0	84.5
Colombia	Empresa Colombiana de Petróleo (ECOPETROL)	20.4	15.1	45.5	54.7
Cuba	Empresa Estatal	100.0	100.0	100.0	100.0
Mexico	Empresa Nacional del Petróleo (ENAP)	100.0	100.0	100.0	100.0
Venezuela	Petróleo Mexicanos (PEMEX)	100.0	100.0	100.0	100.0
Peru	Empresa Petrolera Fiscal (EPF)	6.6	10.1	2.7	33.5
Uruguay	Administración Nacional de Combustibles, Alcohol y Portland (ANCAP)	—	—	100.0	100.0
Venezuela	Corporación Venezolana del Petróleo (CVP)	0.0	0.2	0.2	1.3
Other countries[a]		—	—	—	—
TOTAL		*18.0*	*19.5*	*38.6*	*40.8*

SOURCE: ECLA, on the basis of of official statistics.

[a] Costa Rica, Ecuador, El Salvador, Guatemala, Jamaica, Nicaragua, Panama and Paraguay, in which only private companies operate.

In Cuba and Mexico the State is sole owner of the petroleum industry at all stages.

With respect to production of crude, changes are observable only in Bolivia, Colombia, Peru and Venezuela. In Bolivia, the percentage of State participation was drastically reduced; in Colombia and Peru, respectively, it fell and rose, but to no very marked extent; and in Venezuela, State enterprise made its appearance in the field.

The share of the State in refining activities increased in all countries between 1962 and 1967. In distribution, it was generally less than 10 per cent.

Where transport is concerned, State ownership is hard to evaluate. As a rule, the public sector's activity in this field is linked to the other sectors of industry, and is conditioned by the extent to which the State plays a leading part in the sectors concerned.

It is likewise difficult to determine what proportion of financing comes from fiscal sources (not always declared) and how much is generated by the State enterprise itself. This is because, for a variety of reasons, no clear boundary-line can be drawn between the action of the State concern as an enterprise, in the accepted sense of the term, and its role within the over-all public administration.

Financing from private international sources for State enterprises in Latin America's petroleum sector has been virtually confined to operations tied to purchases of equipment from abroad.

International financing agencies have but recently displayed an inclination to grant loans to the petroleum industry, and those only for transport and refining equipment. The international resources specifically earmarked for oil prospecting are very limited for the time being, and are provided by the Special Fund Component of the United Nations Development Programme (UNDP), which encourages the relatively less developed countries to exploit their natural resources in general.

In only a very few cases, depending essentially upon the importation of technology, has any significant effort been made to set up research and training centres. A step worth noting, in addition to the progress achieved in Brazil, is the establishment of institutes in Argentina, Mexico and Venezuela, with the help of UNESCO and the Institut français du pétrole. In Bolivia a petroleum development centre has been created with the assistance of UNDP. The most ambitious project in this field, however, is that of the mutual aid association of State petroleum enterprises known as Asistencia Recíproca Petrolera Estatal Latinoamericana (ARPEL), which is planning to pool the efforts of the various member countries in order to set up a petroleum research centre for Latin America.

As regards planning, during the 1950s the hydrocarbons sector had shown signs of establishing criteria for the development of these sources of energy, and in a few countries very detailed programmes were mapped out. Generally speaking, however, little progress has been made. Despite some attempts at integration of the energy sector, planning for the petroleum industry has continued in a rut, and little has been done in the way of linkage with the other sources of energy and with over-all economic targets. The only efforts worth mentioning are those made by some countries—for example, Argentina, Brazil and Chile—to draw up over-all balances of all forms of energy, by sources and uses, as a frame of reference for determining what utilization projects are most advisable from the economic standpoint. This subject will be dealt with in greater detail in the discussion of energy development problems that have an impact on the economy.

(f) *Investment*

Tables 33 and 34 show the distribution of gross and net cumulative investment in the petroleum industry among the major producer and consumer regions of the world. It will be seen that the share of Latin America's net cumulative investment in the total was smaller in 1966 than in 1961 and even 1946. This is partly because in recent years investment has been channelled primarily into the new producer areas in the Middle East and North Africa and into the great consumer centres of Western Europe. The phenomenon becomes more marked if Canada and the United States are excluded from the calculation. In that case, Latin America's share, which was about 25 per cent in 1961, drops to approximately 19 per cent by 1966. This trend is essentially attributable to the position of Venezuela, Latin America's leading producer of petroleum. Its contribution to net world petroleum investment (excluding Canada's and the United States') fall from 11.5 per cent in 1961 to 5.9 per cent in 1966.

The functional distribution of cumulative petroleum investment in Latin America is indicated in table 35. The data presented reveal

Table 33

WORLD DISTRIBUTION OF GROSS INVESTMENT IN FIXED ASSETS IN THE PETROLEUM INDUSTRY, 1946-1966

(Percentages of total)

Area	*1946*	*1955*	*1961*	*1965*	*1966*
United States	71.9	63.8	54.5	51.9	51.0
Canada	1.7	4.0	5.0	5.1	5.2
Latin America	9.8	9.3	11.2	10.2	9.9
Venezuela	(4.7)	(5.4)	(5.5)	(4.5)	(4.2)
Other Western Hemisphere countries	(5.1)	(3.9)	(5.7)	(5.7)	(5.7)
Western Europe	4.6	6.4	9.7	11.6	12.3
Africa	0.7	0.7	2.6	3.2	3.2
Middle East	3.7	4.3	4.0	3.7	3.9
Far East	2.2	3.1	4.0	5.0	5.1
International investment in tankers	5.4	8.4	9.0	9.3	9.4
TOTAL *(millions of dollars)*	*24,600*	*63,300*	*111,750*	*144,375*	*154,850*

SOURCES: Chase Manhattan Bank, *Investment Patterns in the World Petroleum Industry* (December 1956); *Capital Investments of the World Petroleum Industry* (November 1962, and other issues).

Table 34

WORLD DISTRIBUTION OF NET INVESTMENT IN FIXED ASSETS IN THE PETROLEUM INDUSTRY, 1946-1966

(Percentages of total)

Area	*1946*	*1955*	*1961*	*1965*	*1966*
United States	70.0	62.0	49.6	48.3	47.5
Canada	1.4	5.0	6.2	6.2	6.2
Latin America	10.3	8.2	11.2	9.1	8.7
Venezuela	(4.9)	(4.4)	(5.1)	(3.1)	(2.7)
Other Western Hemisphere countries	(5.4)	(3.8)	(6.1)	(6.0)	(5.9)
Western Europe	5.1	7.2	11.2	13.3	14.3
Africa	1.0	0.9	3.5	3.9	4.0
Middle East	4.3	4.8	4.2	3.5	3.6
Far East	2.5	3.5	4.3	5.5	5.5
International investment in tankers	5.4	8.4	9.8	10.2	10.2
TOTAL *(millions of dollars)*	*12,150*	*33,725*	*61,250*	*78,200*	*94,275*

SOURCES: Chase Manhattan Bank, *Investment Patterns in the World Petroleum Industry* (December 1956); *Capital Investments of the World Petroleum Industry* (November 1962, and other issues).

a structure for the region as a whole that is by no means the same as in the case of Venezuela alone, since in relative terms it is not comparable with that of the major producer centres, of which Venezuela is one.

In contrast to the situation in Venezuela, it is to be noted that in the rest of Latin America, the capital devoted to refining and marketing activities continued to increase, while more than 50 per cent of total investment was earmarked for production, including exploration.

In 1958 and 1959, the region's share in the capital annually invested in exploration and production in the world petroleum industry (excluding the United States and the socialist

Table 35

LATIN AMERICA: STRUCTURE OF CUMULATIVE INVESTMENT IN THE PETROLEUM INDUSTRY, 1946-1966

Activity	*Gross cumulative investment*							*Net cumulative investment*						
	1946	*1955*	*1962*	*1963*	*1964*	*1965*	*1966*	*1946*	*1955*	*1962*	*1963*	*1964*	*1965*	*1966*
	Millions of dollars													
Production	1,770	3,540	7,950	8,195	8,405	8,655	8,860	890	1,425	3,725	3,650	3,685	3,700	3,625
Transport	105	320	1,015	1,040	1,080	1,105	1,185	60	190	585	575	565	565	600
Refining	370	1,380	2,425	2,580	2,760	2,880	2,890	205	740	1,340	1,460	1,560	1,370	1,565
Marketing	140	615	1,480	1,535	1,600	1,655	1,710	85	390	940	965	995	1,015	985
Other activities	15	35	255	275	280	265	275	10	30	210	225	220	195	195
TOTAL	*2,400*	*5,890*	*13,125*	*13,625*	*14,125*	*14,580*	*14,920*	*1,250*	*2,775*	*6,800*	*6,875*	*7,025*	*6,845*	*6,970*
	Percentage distribution													
Production	73.8	60.1	60.6	60.2	59.5	59.0	59.5	71.2	51.3	54.8	53.1	52.5	54.0	52.0
Transport	4.4	5.4	7.7	7.6	7.7	7.6	7.8	4.8	6.8	8.6	8.4	8.0	8.3	8.6
Refining	15.4	23.4	18.5	18.9	19.5	20.2	19.4	16.4	26.7	19.7	21.2	22.2	20.0	22.4
Marketing	5.8	10.5	11.3	11.3	11.3	11.4	11.5	6.8	14.1	13.8	14.0	14.2	14.8	14.2
Other activities	0.6	0.6	1.9	2.0	2.0	1.8	1.8	0.8	1.1	3.3	3.1	2.9	2.9	2.8

SOURCE: Chase Manhattan Bank, *Investment Patterns in the World Petroleum Industry* (December 1956) and *Capital Investments of the World Petroleum Industry* (1962, 1963, 1964, 1965 and 1966).

countries) amounted to over 40 per cent, whereas it declined to 36 per cent in 1960 and 28 per cent in 1963, and is estimated to have been 19.5 per cent in 1965 (see table 36). This reduction is mainly due to the decrease in Venezuela's investment, since the proportion corresponding to the other Latin American countries as a group follows a rising trend.

Argentina, Brazil, Mexico and Venezuela account for more than 80 per cent of Latin America's annual investment in exploration and production. The addition of Colombia and Trinidad and Tobago would raise this figure to over 90 per cent.

Taking the average for the region, investment in exploration (including the drillings involved) represents 30 per cent of total investment in exploration and production. The corresponding proportion is lowest in Argentina, where it is only 15 per cent; next comes Venezuela, with 20-25 per cent; in Mexico the share of exploration reaches 40-50 per cent, and in Brazil it is as much as 70 per cent (see table 36).

More than 60 per cent of annual investment in refineries is effected by Argentina, Brazil, Mexico and Venezuela (see table 37). Although precise data are not available, it is known that in the last few years almost all the Latin American countries have been placing investment in this sector.

Venezuela's percentage contribution to an-

Table 36

LATIN AMERICA: GROSS INVESTMENT IN EXPLORATION AND PRODUCTION, 1956-1966

(Millions of dollars)

Country or region	*1956*	*1957*	*1958*	*1959*	*1960*	*1961*	*1962*	*1963*	*1964*	*1965*	*1966*
Argentina											
Exploration	...	...	...	...	...	...	...	...	...	...	...
Production	...	...	...	...	...	...	...	...	...	...	...
TOTAL	...	...	...	...	*225*	*225*	*180*	*120*	...	...	...
Bolivia TOTAL	...	...	...	...	*10*	*6*	*7*	*7*	...	...	...
Brazil											
Exploration	17	31	41	36	33	35	41	48	44	46	42
Production	9	16	12	8	12	15	15	14	16	19	24
TOTAL	*26*	*47*	*53*	*44*	*45*	*50*	*56*	*62*	*60*	*65*	*66*
Colombia											
Exploration	15	16	12	20	...	...	...	...	...	...	...
Production	9	12	11	20	...	...	...	...	...	...	...
TOTAL	*24*	*28*	*23*	*40*	*30*	*25*	*20*	*20*	*40*	...	...
Chile TOTAL	...	...	...	...	*5*	*20*	*25*	*18*	*12*	*11*	...
Ecuador TOTAL	...	...	...	...	*15*	*4*	*1*	*1*	...	...	...
Mexico											
Exploration	11	23	29	42	41	51	48	54	...	...	...
Production	6	13	17	24	59	49	33	31	...	...	...
TOTAL	*17*	*36*	*46*	*66*	*100*	*100*	*81*	*85*	...	...	...
Peru TOTAL	...	...	...	...	*30*	*20*	*18*	*15*	...	...	...
Trinidad and Tobago											
TOTAL	...	...	...	...	*30*	*31*	*35*	*30*	...	...	...
Venezuela											
Exploration	...	...	...	117	59	30	36	30	43	...	...
Production	...	...	...	211	142	134	96	119	108	...	...
TOTAL	*365*	*530*	*500*	*328*	*201*	*164*	*132*	*149*	*151*	*180*	*130*
Latin America TOTAL	*565*	*811*	*820*	*785*	*691*	*645*	*554*	*506*	*425*	*500*	*440*
Latin America excluding Venezuela	*200*	*281*	*320*	*457*	*490*	*481*	*422*	*358*	*274*	*315*	*310*

SOURCE: Chase Manhattan Bank, *Capital Investments of the World Petroleum Industry* (various issues); Ministry of Planning, *Petróleo* (Rio de Janeiro); Ministry of Mines and Hydrocarbons, *Petróleo y otros datos estadísticos* (Caracas); *PEMEX en cifras* (Mexico), Nacional Financiera, S.A., *La economía mexicana en cifras* (1966); ECLA/BTAO/FAO, *El petróleo en Colombia* (July 1961).

Table 37

LATIN AMERICA: GROSS INVESTMENT IN REFINING, 1956-1966

(Millions of dollars)

Country	*1956*	*1957*	*1958*	*1959*	*1960*	*1961*	*1962*	*1963*	*1964*	*1965*	*1966*
Argentina	...	...	...	...	10	35	10	5	...	...	...
Brazil	17	17	35	54	66	47	44	41	38	32	23
Mexico	...	...	...	...	30	20	20	40	...	...	...
Venezuela	75	87	56	40	12	10	8	6	17	10	5
Colombia	...	...	...	...	5	3	6	5	...	...	...
Chile	...	...	...	...	10	10	4	13	19	...	...
Ecuador	...	...	...	...	2	2	—	—	...	...	...
El Salvador	...	...	...	...	—	2	5	8	...	...	...
Guatemala	...	...	...	...	—	—	—	3	...	...	...
Honduras	...	...	...	...	—	—	15	—	...	...	...
Jamaica	...	...	...	...	—	—	—	1	...	...	...
Nicaragua	...	...	...	...	—	3	2	2	...	...	...
Panama	...	...	...	...	14	20	—	2	...	...	...
Peru	...	...	...	...	2	11	1	2	...	...	...
Trinidad and Tobago	...	...	...	...	15	5	10	18	...	...	...
Uruguay	...	...	...	...	5	10	—	5	...	...	...
TOTAL *Latin America*	*230*	*245*	*160*	*170*	*171*	*177*	*125*	*151*	*220*	*135*	*305*

SOURCES: Chase Manhattan Bank publications, except in the case of Brazil, where the data was taken from the Ministry of Planning, *Petróleo (Diagnóstico preliminar)* (July 1966) and were adjusted for the State enterprise PETROBRAS: the figures for private companies were estimated on the basis of information published in *Conjuntura Económica* (Rio de Janeiro), various issues. For Venezuela the data given in Ministry of Mines and Hydrocarbons, *Petróleo y otros datos estadísticos,* were used, the following dollar conversion rates being applied: 1947 to 1963, 3.09 bolívares to the dollar; other years, 4.40 bolívares to the dollar.

nual investment in refineries has dropped steeply in recent years, while the opposite trend is shown by the other Latin American countries in the aggregate.

Exact data on annual investment in transport are difficult to obtain. The estimated totals presented in table 38 must be a good deal lower than the real figures, as it was only on investment in oil pipelines that relatively reliable information was to be had. Equipment for rail and road transport, which is important in some areas or for certain products, could not be evaluated for want of adequate statistics.

On maritime transport, only sporadic data for Brazil and Venezuela are available. For the other countries investment was estimated on the basis of the increases in their tanker fleets.

Annual investment in transport fluctuated widely in the early years of the decade considered, in consequence of events in Venezuela during the 1950s.

Annual investment in the marketing sector is shown in table 39. Generally speaking, the data relate to all petroleum products. In Venezuela's case, investment under this head is minimal in comparison with the share of other activities. In the rest of the region, it absorbs from 10 to 20 per cent of total annual investment in the petroleum industry. The explanation of the downward trend observable lies in the disproportionate increase in investment in refining and transport.

No published data are available on the basis of which investment in the utilization of natural gas can be evaluated separately from total investment in the branches of the petroleum industry concerned. An illustrative estimate of its magnitude (based on data relating to the size of the distribution networks of the chief consumers of gas in Argentina) is given in table 40. The figures do not include heavy outlays in connexion with the production or refining of hydrocarbons in all the countries that are major consumers of associated natural gas.

Except in the special cases of Argentina and Mexico, it was only after the Second World War that the share of domestic capital in total investment in the petroleum industry in Latin America acquired a measure of significance which progressively increased during the 1960s.

A comparison between cumulative Latin American investment and direct foreign invest-

Table 38

LATIN AMERICA: NEW INVESTMENT IN TRANSPORT OF CRUDE PETROLEUM AND PETROLEUM PRODUCTS, 1956-1965

(Millions of dollars)

Type of transport	*1956*	*1957*	*1958*	*1959*	*1960*	*1961*	*1962*	*1963*	*1964*	*1965*
A. *Oil pipelines*										
Argentina	...	...	...	...	50	25	25	5	...	...
Bolivia	...	...	...	...	5	3	0	0	...	...
Brazil	...	...	...	...	15	12	9	8	15	19
Colombia	...	...	...	...	3	1	2	10	...	...
Chile	...	...	...	...	2	6	1	3	...	...
Ecuador	...	...	...	...	1	0	0	0	...	...
Mexico	...	...	...	...	50	10	20	5	...	...
Peru	...	...	...	...	1	0	0	0	...	...
Venezuela	35	70	110	30	20	5	5	5	5	5
TOTAL *Latin America*	*45*	*95*	*135*	*205*	*147*	*62*	*62*	*36*	*25*	*25*
B. *Tankers*										
Brazil	3	10	19	20	46	12	7	16	10	7
Venezuela	5	5	15	0	5	0	0	0	0	0
Other countries	...	...	5	5	5	5	4	4	4	15
TOTAL *Latin America*	*8*	*15*	*39*	*25*	*56*	*17*	*11*	*20*	*14*	*22*
C. Total (A+B)	53	110	174	230	203	79	73	56	39	47

SOURCES: Calculated on the basis of data supplied by the Chase Manhattan Bank, PETROBRAS (Brazil) and ECLA.

Table 39

LATIN AMERICA: NEW INVESTMENT IN MARKETING, 1956-1965

Years	*Millions of dollars*		*Percentage of total investment in the petroleum industry*	
	Venezuela	*Other countries*	*Venezuela*	*Other countries*
1956	10	70	1.2	16.5
1957	10	80	0.9	15.2
1958	15	95	2.0	18.1
1959	15	100	3.2	11.8
1960	15	110	5.2	12.0
1961	15	175	7.5	19.4
1962	10	100	5.2	14.0
1963	10	75	5.0	11.1
1964	20	75	9.5	11.8
1965	10	75	4.8	11.4

SOURCE: Chase Manhattan Bank, *Capital Investment of the World Petroleum Industry,* various issues.

ment is possible only at a somewhat unsatisfactory level of approximation, not merely for want of complete information but also because of discrepancies between data from different sources. Nevertheless, in table 41 an analysis of this type is attempted. Both here and in table 35 above it can be seen that foreign investment represented about 80 per cent of the total in 1956. In the years 1962, 1963 and 1964 the corresponding proportions were 56, 54 and 43 per cent, respectively.

Since the 1920s, petroleum investment in

Table 40

ARGENTINA: INVESTMENT IN UTILIZATION OF NATURAL GAS, 1959-1965

(Millions of dollars)

Year	*Production*	*Transport*	*Storage*	*Marketing*	*Other activities*	*Total*
1959	3.4	2.9	—	1.5	1.4	9.2
1960	11.4	188.5	0.4	7.2	2.4	211.9
1961	17.9	18.6	0.2	13.2	2.5	52.4
1962	31.0	20.2	2.3	5.2	3.3	62.0
1963	46.0	12.8	1.4	5.4	2.8	68.4
1964	21.2	68.2	3.9	5.9	3.3	192.5
1965	17.5	66.0	7.4	5.8	4.2	100.9

SOURCE: *Gas del Estado.* For conversion to dollars, the following exchange rates, published in International Monetary Fund, *International Financial Statistics,* were applied:

Year	*Pesos to the dollar*
1959	82.00
1960	83.00
1961	83.02
1962	134.10
1963	132.50
1964	150.90
1965	188.50

Table 41

LATIN AMERICA: CUMULATIVE GROSS FOREIGN INVESTMENT, 1956-1964

(Millions of dollars)

Year	*Venezuela*				*Other countries*[a]	*Total*
	United States	*United Kingdom*	*Netherlands*	*Total*		
1956	2,610	475	1,151	4,236	821	5,057
1957	...	...	...	...	881	...
1958	3,438	581	1,419	5,438	909	6,347
1959	3,429	579	1,430	5,438	1,148	6,586
1960	3,693	2,048	—	5,741	1,269	7,010
1961	3,679	2,090	—	5,769	...	...
1962	3,822	2,007	—	5,829	1,442	7,271
1963	3,850	1,961	—	5,811	1,470	7,281
1964	3,271	1,384	—	4,655	1,491	6,146

SOURCES: For Venezuela, reports of the Central Bank; for other countries, United States Department of Commerce, *Survey of Current Business,* various issues.

[a] United States investment only.

Latin America has been characterized by the predominance of United States capital in total foreign investment in the region as a whole, and by the growing proportion of this investment that has been placed in Venezuela.

Latin America's share in the United States' total external investment in the petroleum industry has steadily diminished, however, dwindling from 55 per cent in 1930 to 30 per cent in 1956 and an estimated 23 per cent by 1965. In contrast, the percentage of the total in question that fell to Venezuela remained fairly stable up to 1956; thenceforward it declined until by 1965 it was 13 per cent.

The trends described above can be traced in tables 42 and 43.

Table 42

UNITED STATES: CUMULATIVE DIRECT INVESTMENT IN THE PETROLEUM INDUSTRY[a] IN LATIN AMERICA AND THE REST OF WORLD, 1956-1965

(Millions of dollars)

Country or region	*1956*	*1957*	*1958*	*1959*	*1960*	*1961*	*1962*	*1963*	*1964*	*1965*[b]
TOTAL	*7,280*	*8,991*	*9,681*	*10,423*	*10,944*	—	*12,661*	*13,652*	*14,334*	*15,320*
Canada	1,768	2,154	2,410	2,465	2,667	—	2,834	3,134	3,187	3,320
Latin America[c]	2,232	3,060	3,211	3,312	3,264	—	3,644	3,636	3,630	3,534
Brazil	211	227	215	82	76	—	79	60	53	57
Colombia	107	106	91	225	233	—	257	246	255	265
Mexico	17	18	19	30	32	—	67	65	56	48
Venezuela	1,411	2,179	2,302	2,164	1,995	—	2,202	2,166	2,139	2,033
Other Latin American countries	486	530	584	811	928	—	1,039	1,099	1,127	1,131
Europe	992	1,184	1,256	1,453	1,726	—	2,365	2,776	3,102	3,429
Africa	—	254	276	338	407	—	627	702	883	1,020
Asia	—	1,747	1,864	1,662	1,655	—	1,761	1,920	2,054	2,384
Middle East	—	1,118	1,218	1,170	1,119	—	1,148	1,206	1,240	1,491
Far East	—	629	646	492	536	—	612	714	814	893
Oceania	—	—	—	355	372	—	462	496	453	499
International investment in tankers	—	593	664	838	851	—	968	988	1,064	1,133

SOURCE: United States Department of Commerce, *Survey of Current Business*, various issues.

[a] United States, external investment.

[b] Provisional data.

[c] Including dependent territories in the Western Hemisphere.

Table 43

UNITED STATES: DIRECT INVESTMENT IN PLANT AND EQUIPMENT IN THE PETROLEUM INDUSTRY IN LATIN AMERICA AND THE REST OF WORLD, 1957-1965

(Millions of dollars)

Country or region	*1957*	*1958*	*1959*	*1960*	*1961*	*1962*	*1963*	*1964*	*1965*
TOTAL	2,322	1,854	1,558	1,467	1,534	1,628	1,889	2,073	2,267
Canada	584	510	380	360	315	300	375	385	503
Latin America[a]	1,039	577	449	340	306	339	307	327	968
Brazil	—	—	5	5	5	4	3	4	3
Colombia	—	—	25	25	30	32	30	58	35
Mexico	—	—	1	1	2	2	10	5	2
Venezuela	—	—	280	160	135	145	142	134	130
Other Latin American countries	—	—	128	149	134	156	122	126	198
Europe	275	422	399	345	438	494	642	645	603
Africa	—	—	74	115	171	176	164	271	284
Asia	—	—	172	176	195	178	297	280	430
Middle East	—	—	81	76	87	72	125	111	233
Far East	—	—	91	101	108	106	172	169	197
Oceania	—	—	44	66	64	76	64	65	74
International investment in tankers	—	—	100	65	45	65	40	100	66

SOURCE: United States Department of Commerce, *Survey of Current Business*, various issues.

[a] Including dependent territories in the Western Hemisphere.

Even more meagre are the data available for a breakdown of foreign investment by sectors of the petroleum industry. A certain amount of very general information, however, warrants the conclusion that the structure of United States investment in Venezuela has not changed much since 1957. Of total net investment in that year, 88 per cent was absorbed by production, 11 per cent by refining and 1 per cent by marketing. In more recent years there seems to have been a slight reduction in the share of refining and some increase in that of marketing.

In the rest of Latin America, on the other hand, the distribution of United States investment in the later years of the period considered shows marked differences from the pattern in 1957. In total investment in that year, the respective shares of production, refining and marketing were 55, 18 and 27 per cent, whereas more recently the corresponding proportions were 44, 36 and 23 per cent.

(g) *Reserves of crude oil and natural gas*

At the end of 1967, world reserves of petroleum exceeded 414,000 million barrels. Latin America's contribution to this total was little more than 6 per cent, or less than half what it had been 20 years before. Venezuela accounted for over 60 per cent of Latin American reserves, with Mexico, Argentina and Colombia following a long way behind (see table 44, column A).

Within the whole picture of world reserves, the scantiness of proven reserves in Latin America is striking.

Furthermore, the region's reserves/production ratio is low in relation to the world average and insignificant in comparison with that of certain regions, such as the Middle East. The same is true of average output per well.

Despite its outstanding position within Latin America, Venezuela's reserves/production ratio was 12.3 in 1967, whereas the world average was 32.3 and the corresponding figure for the Middle East was 68.6.

Output per well in Latin America may fall as low as 8 barrels daily, as is the case in Ecuador. The average for the region is about 150 barrels daily, but drops to 60 barrels daily in Venezuela, whose output per well is the highest in the region, i.e., about 300 barrels daily, is excluded from the calculation. Yet Venezuela's rate of productivity lags incomparably far behind that of Iran (15,000 barrels daily), Iraq (10,500), Arabia (7,100), and Kuwait (4,600), and is also a long way below the rates attained by African countries such as Algeria (1,350 barrels daily) or Nigeria (1,150).

Although certain changes in average output per well took place in individual countries during the 1960s (see table 45), average production for the region underwent no appreciable variations in the same period.

If the petroleum-producing countries of Latin America are considered individually, the following points may be noted in connexion with reserves.

Probable and possible reserves in Venezuela are estimated to be perhaps twice or three times as large as its proven reserves. Moreover, the figure given might be raised if the recovery factor were improved by virtue of the pertinent technical advances. It must not be forgotten, however, that Venezuela is pre-eminently a petroleum-exporting country, and that even on the assumption of a relatively significant expansion of its domestic market it will necessarily have to adjust its targets and objectives to the external consumer market, where, at the present time, the Middle East carries preponderant weight by reason of its huge reserves, its high yields per well, and its resultant low production costs.

Bolivia's picture is entirely different from Venezuela's. Its proven reserves are scanty, but its exports too are modest, and its domestic consumption is so low that even if it were to increase at maximum reasonable growth rates, it could easily be satisfied with the proven reserves existing at present. The situation might change fairly rapidly, however, if regional integration mechanisms came into operation in respect of petroleum, since the country would then find its natural market and would probably start to produce on a far larger scale, with the result that the reserves/production ratio would rapidly decrease.

Between these two extremes comes Colombia, whose petroleum reserves soared between 1955 and 1967. It is in a position to supply a steadily increasing domestic consumption with ease and ready to regain its status as a relatively important exporter country. Nearly half its output comes from recently-discovered oilfields where yields are high in relation to the average for the region as a whole.

Mexico has successfully implemented its policy of self-sufficiency, while at the same time keeping its reserves in due proportion to its current production. The estimated growth of demand in the 1970s, however, will necessitate a substantial increase in its reserves.

Table 44

LATIN AMERICA AND SELECTED OTHER REGIONS AND COUNTRIES: PETROLEUM RESERVES AND PRODUCTION, 1955, 1960, 1965 AND 1967

(Millions of barrels)

Country or region	1955			1960			1965			1967		
	Reserves (A)	*Production (B)*	*A/B*	*Reserves (A)*	*Production (B)*	*A/B*	*Reserves (A)*	*Production (B)*	*A/B*	*Reserves (A)*	*Production (B)*	*A/B*
Argentina	350	30	11.7	1,550	64	24.2	2,900	98	29.6	3,050	115	26.5
Bolivia[a]	70	3	35.0	125	3	41.5	500	3	167.0	600	14	42.9
Brazil	35	2	17.5	375	30	12.5	672	34	19.7	800	54	14.8
Colombia	600	40	15.0	625	55	11.4	1,700	73	23.2	2,000	69	29.0
Chile	50	2	25.0	60	7	8.6	150	13	11.5	150	12	12.5
Ecuador	25	3	8.3	25	3	8.3	20	3	6.7	330	2	165.0
Mexico	1,500	91	16.5	2,458	109	23.0	2,495	132	18.9	2,650	150	17.7
Peru	225	17	13.2	300	19	15.8	300	23	13.0	350	24	14.6
Trinidad and Tobago	270	25	10.8	390	42	9.3	425	49	8.7	450	65	6.9
Venezuela	12,429	787	15.8	17,402	1,042	16.7	17,250	1,268	13.6	15,950	1,293	12.3
TOTAL *Latin America*	*15,554*	*1,003*	*15.5*	*23,310*	*1,377*	*16.9*	*26,412*	*1,696*	*15.6*	*26,330*	*1,798*	*14.6*
United States	29,561	2,484	11.9	31,613	2,575	12.3	31,352	2,849	11.0	37,541	3,212	11.7
Soviet Union and other socialist areas	10,000	518	19.3	23,579	1,080	21.8	35,000	1,766	19.8	35,773	2,277	15.7
Middle East	132,927	1,184	112.3	162,840	1,922	84.7	222,777	3,040	74.4	249,209	3,631	68.6
Algeria	—	—	—	4,600	67	68.7	6,300	201	31.4	6,900	296	23.3
Libya	—	—	—	3,000	—	—	13,000	445	29.2	29,200	627	46.6
Nigeria	—	—	—	200	6	33.3	2,500	99	25.3	3,550	126	43.7
WORLD TOTAL	*196,990*	*5,642*	*34.9*	*265,684*	*7,657*	*34.7*	*364,961*	*11,011*	*33.2*	*414,340*	*12,822*	*32.3*

SOURCE: *Oil and Gas Journal* and official data.

[a] The official data received while this document was being reproduced indicate considerably smaller reserves.

Table 45

LATIN AMERICA: PETROLEUM OUTPUT PER WELL, 1955, 1960, 1965 AND 1966

(Average output per producing well)

Country	*1955*			*1960*			*1965*			*1966*		
	Production (Thousands of barrels daily)	*Number of producing wells*	*Output per well*	*Production (Thousands of barrels daily)*	*Number of producing wells*	*Output per well*	*Production (Thousands of barrels daily)*	*Number of producing wells*	*Output per well*	*Production (Thousands of barrels daily)*	*Number of producing wells*	*Output per well*
Argentina	84	2,528	33	172	3,750	46	269	6,700	40	287	6,880	42
Bolivia	7	54	130	10	127	78	9	152	59	17	211	81
Brazil	6	296	200	81	686	118	94	621	152	116	857	135
Colombia	111	1,809	62	152	2,143	71	201	2,148	95	197	2,197	90
Chile	7	42	160	20	125	160	35	250	140	34	279	122
Ecuador	10	1,597	6	8	1,733	5	8	931	8	7	871	8
Mexico	250	1,513	165	271	2,154	126	323	2,625	123	370	2,622	141
Peru	47	3,056	15	53	2,209	24	63	2,237	28	63	2,393	26
Trinidad and Tobago	68	2,745	25	115	3,202	36	134	3,308	40	150	3,430	44
Venezuela	2,157	9,716	230	2,846	9,993	285	3,473	11,641	300	3,371	11,416	295
TOTAL *Latin America*	*2,747*	*23,366*	*120*	*3,767*	*26,062*	*145*	*4,648*	*30,613*	*154*	*4,612*	*31,156*	*148*
Latin America excluding Venezuela		13,650		882	16,069	55	1,136	18,972	59	1,241	19,740	63

SOURCE: ECLA, on the basis of official statistics.

Most of Argentina's requirements in respect of hydrocarbons are met with domestic production. In this country exploration has covered 82 per cent of the whole sedimentary area (1 million square kilometres). It is probable that new stratigraphic and structural traps will be found in the basins already known as oil-bearing, and that petroleum will be discovered at greater depths, with the result that prospects of better rates of productivity will be opened up although drilling will be slower and more costly. Given intensive exploration and the adoption of secondary recovery procedures, it is thought that reserves greatly exceeding those known at present might be calculated over the short term.

Uruguay has sedimentary deposits amounting to about 147,000 square kilometres where conditions are presumably suitable for hydrocarbons to accumulate. So far, however, all exploratory efforts have met with failure, and technical circles in Uruguay have virtually dismissed the possibility of finding petroleum, at any rate in economically exploitable quantities,[2] except on the continental shelf and in the River Plate basin.

Brazil possesses sedimentary basins with a total extent of 3 million square kilometres, of which its proven reserves cover only a minute percentage. In recent years exploration has been mainly concentrated in the Reconcavo, Sergipe, Alagoas and Tucano areas. The aim is to obtain new reserves over the short term so that Brazil can reduce its imports, on which it depended in the second half of the 1960s for the satisfaction of over 50 per cent of consumption. Exploration of the continental shelf has already begun, and serious consideration is being given to the exploitation of its abundant "schists",[3] a step which might radically alter the energy picture in Brazil. It is too soon, however, to draw conclusions as to the increase in reserves which may result from these activities.

The whole of Chile's proven reserves are located in the far south, in the Magallanes basin. Prospecting in other parts of Chilean territory has so far been fruitless.

The situation in Peru is unstable. Domestic production of petroleum, generally speaking, meets home consumption requirements. But whereas Peru was formerly a net exporter it has become an importer on a moderate scale, especially of fuel oil and special gasolines. But there are vast tracts of Peru's territory which are virtually virgin soil from the standpoint of oil prospecting.

Ecuador's reserves/production ratio, which had declined appreciably since 1955, recovered in the mid-1960s, and the oilfields discovered in the north, near the Colombian frontier, are expected to do much to improve it. Possible agreements between Ecuador and Colombia under which companies could explore the Putumayo area as a single oilfield might be an additional incentive to its development.

Lastly, in Trinidad and Tobago sizable areas still remain to be explored. The best prospects, however, would seem to be afforded by the continental shelf. Little information was obtainable on this country.

Except in Venezuela, which may be regarded as a world leader in secondary recovery, these processes are not in very common use in the Latin American countries, to judge from the data available. The adoption of up-to-date techniques might revolutionize the Latin American situation in respect of petroleum reserves.

Natural gas is commonly found in association with crude petroleum, as well as in gas accumulations existing independently. It may either be dry or contain separable liquids.

Little is known as to proven reserves of gas found by itself in the region, and most of the data presented in table 46 relate to gas obtained from oilfields.

Table 46

LATIN AMERICA: RESERVES OF NATURAL GAS, 1961, 1965 AND 1967

(Thousands of millions of cubic metres)

Country	*1961*	*1965*	*1967*
Argentina	169.9	212.0	225.4
Bolivia	7.1	57.0	114.7
Brazil	9.9	20.0	24.8
Colombia	39.6	100.0	114.1
Chile	51.0	80.0	100.0
Ecuador	2.1	2.0	33.0[a]
Mexico	353.7	370.0	328.4
Peru	20.5	56.0	57.0
Trinidad and Tobago	34.0	34.0	34.3
Venezuela	919.5	850.0	899.7
TOTAL	*1,607.3*	*1,781.0*	*1,931.4*

SOURCES: *World Petroleum, Oil and Gas Journal* and other official publications for selected years and countries.

[a] Including estimated reserves of gas associated with petroleum in the Lago Agrio, Bermejo and Charapa Oilfields.

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[2] See the document presented by the Administración Nacional de Combustibles, Alcoholes y Portland (ANCAP) at the second regular session of ARPEL.

[3] The word *"esquistas"* in the Spanish text seems to refer to what are known in Brazil as *"lutitas"*.

Possible reserves of independent gas are known to be significant, and the figures appearing here may undergo substantial modification over the short term, especially as Bolivia's reserves have not been calculated, and exploration of gas fields in Venezuela has only just begun.

The most important of the known gas fields are to be found in Argentina, Bolivia, Mexico and Trinidad and Tobago.

To judge from present information, the development of Bolivia's reserves might have an appreciable impact on the energy situation in Latin America. Apparently, as in the case of petroleum, it would largely depend upon the operation of regional integration machinery.

A decision on Venezuela's part to undertake the liquefying of natural gas for export might well serve as an incentive to the development of its possible reserves of independent gas.

It is important for any oil-bearing area to increase its reserves faster than its production, as a precaution against a medium-term contraction of output and, in the long run, the depletion of reserves.

Although it is impossible to establish a linear relationship between the exploration and drilling undertaken and the growth rate of reserves, they are fairly closely linked, particularly over the long term. In terms of crew months, geophysical activity in Latin America declined between 1959 and 1966 (see tables 47 and 48). This does not necessarily imply a proportional decrease in the area covered, since between the input of crew months and the size of the area explored no precise correlation can be established. Bolivia, Brazil and Venezuela show the sharpest downturns, while Argentina records increases up to 1962 and Chile up to 1963. Mexico is the only country presenting more or less stable figures, within a rising trend. In Venezuela geophysical activity has slackened since 1960; between 1959 and 1965, it decreased at an annual rate of 35 per cent.

The drilling of exploratory wells has remained at the same level, although with fluctuations and downward movements, in almost all countries in the 1960s (see table 49). The only exceptions were Venezuela, where a fairly marked decline took place, and Argentina, which substantially increased its exploratory drilling.

In 1957-1966, the total number of wells drilled per annum, including exploratory wells, diminished by 75.8 per cent (see table 50). But once again an arresting feature is the steep downward trend shown by Venezuela, where total drilling was reduced by 66 per cent. In Colombia too the decrease was striking, approaching 50 per cent. In Argentina drilling boomed between 1957 and 1962, fell off sharply in the next two years, and showed signs of recovery in 1965 and 1966. In Mexico and Chile the trend of activity was favourable on the whole until 1964, but turned downward in the last two years of the period.

A moderately accurate forecast of the medium- and long-term prospects with respect to reserves, and therefore to the essential bases for planning future exploitation, calls for adequate knowledge of a number of factors and elements on which information is lacking at present. Nevertheless, it seems fairly safe to assume that except in the case of Venezuela, which displays the special features described

Table 47

LATIN AMERICA: GEOPHYSICAL ACTIVITIES, BY COUNTRIES, 1959-1966

(Crew/months)

Year	*Argentina*	*Bolivia*	*Brazil*	*Colombia*	*Cuba*	*Chile*	*Mexico*	*Peru*	*Trinidad and Tobago*	*Venezuela*	*Other countries*	*Total*
1959	355	166	317	107	...	60	264	50	6	102	51	1,478
1960	389	83	265	59	...	64	248	34	3	9	26	1,180
1961	350	42	187	37	...	70	255	20	7	7	12	987
1962	411	24	191	77	...	81	250	20	5	3	45	1,107
1963	323	41	291	107	—	94	246	17	10	12	12	1,153
1964	323	47	252	137	35	77	252	6	—	2	2	1,133
1965	279	73	282	79	...	69	292	21	2	8	27	1,132
1966	276	27	232	48	...	68	310	5	3	8	35	1,012

Source: World Oil (15 August issue of each year).

Table 48

LATIN AMERICA: GEOPHYSICAL ACTIVITIES, BY TYPES, 1959-1966

(Crew/months)

	1959	*1960*	*1961*	*1962*	*1963*	*1964*	*1965*	*1966*
Seismic	1,095	896	790	877	858	849	838	782
Gravimetric	383	260	187	206	238	223	250	174
Magnetic	—	24	10	8	33	36	13	12
Other	—	—	—	16	24	25	31	44
TOTAL	*1,478*	*1,181*	*987*	*1,107*	*1,153*	*1,133*	*1,132*	*1,012*

SOURCE: World Oil (15 August issue of each year).

Table 49

LATIN AMERICA: EXPLORATION WELLS COMPLETED, 1958-1963, 1966 AND 1967

Country	*1958*	*1959*	*1960*	*1961*	*1962*	*1963*	*1966*	*1967*
Argentina	33	...	121	86	130	111	...	105
Bolivia	9	12	18	14	13	13	16	17
Brazil	56	92	95	76	70	76	91	109
Colombia	32	37	36	39	20	54	15	14
Chile	20	19	11	14	19	14	21	10
Ecuador	3	6	8	4	—	1	32	21
Mexico	76	81	103	106	84	60	129	127
Peru	14	3	21	26	25	25	22	32
Venezuela	168	103	62	77	69	54	37	8
TOTAL *Latin America*	*411*	*353*	*475*	*440*	*430*	*408*	*363*	*443*

SOURCE: *World Oil.*

above, the reserves/production coefficient may be maintained or improved in most of the Latin American countries, provided that sufficient funds are available for exploration to be conducted at a satisfactory level.

2. *Electric energy*

(a) *Trends in electric energy consumption*

(i) *Growth trends in generation of electric energy.* In 1958-1967, there was a steady although not a uniform increase in the generation and consumption of electric energy in Latin America. The cumulative annual growth rate of installed generating capacity averaged approximately 8.0 per cent, and that of generation itself, 7.7 per cent, while the rate of increase of the gross product was approximately 4.5 per cent. These figures, however, mask inter-country differences in rates of expansion, as well as considerable variations from one year to another. In Latin America as a whole, the increase in generation of electric energy between 1958 and 1959 was 10 per cent, whereas in subsequent years the rate fluctuated between 7 and 8 per cent.

The shortage of generating and distribution capacity in some of the major electricity systems at the beginning of the 1960s has been somewhat relieved; but there are still many population centres where electricity is supplied only for a certain number of hours each day, and others where the expansion of consumption is cramped by inadequate generating, transmission or distribution capacity.

Separate study of selected countries reveals that between 1958 and 1967 generation of electric energy increased at the following average rates: 34.4 per cent in Surinam; 14.7 per cent in Guyana; 12.6 per cent in Honduras; 11.7 per cent in Trinidad and Tobago; and between 10 and 12 per cent in Ecuador, Peru, Venezuela, El Salvador, Nicaragua, Panama and the Dominican Republic. In the remaining countries growth rates were lower, with Haiti at the bottom of the list, showing an annual rate of expansion of only 2.7 per cent (see tables 51 and 52).

Table 50

LATIN AMERICA: NUMBER OF WELLS DRILLED PER ANNUM, 1955-1966

Year	*Argentina*	*Bolivia*	*Brasil*	*Colombia*	*Cuba*	*Chile*	*Ecuador*	*Mexico*	*Peru*	*Trinidad and Tobago*	*Venezuela*	*Total*
1955	284	21	73	117	95	58	212	330	219	213	1,163	2,785
1956	310	25	45	138	104	63	151	402	199	262	1,449	3,148
1957	338	37	90	156	89	68	68	389	151	314	1,721	3,421
1958	392	36	140	174	61	74	40	379	138	295	1,184	2,913
1959	574	30	229	219	1	90	31	440	65	278	692	2,649
1960	1,167	43	233	173	3	56	72	762	150	312	444	3,415
1961	1,639	39	241	110	22	85	83	726	156	288	477	3,866
1962	1,289	48	177	94	20	111	223	639	143	280	536	3,360
1963	803	38	198	90	20	95	33	554	148	236	498	2,713
1964	506	31	233	78	15	99	52	631	137	190	621	2,593
1965	555	28	225	77	15	47	49	361	160	214	694	2,425
1966	712	52	331	52	. . .	39	43	297	158	268	394	2,346

SOURCE: *World Oil.* The figures for Chile, Ecuador, Mexico, Trinidad and Tobago and Venezuela are drawn from official sources.

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LATIN AMERICA: ELECTRIC

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Country	1958								
	Public supply			*Self-supply*			*Total for the country*		
	H	*T*	*Total*	*H*	*T*	*Total*	*H*	*T*	*T*
Argentina	272	1,858	2,130	23	877	900	295	2,735	3
Bolivia	70	11	81	22	40	62	92	51	
Brazil	3,021	604	3,626	202	165	367	3,224	769	3
Colombia	453	177	630	37	191	228	490	368	
Chile	411	123	534	111	369	480	522	492	1
Ecuador	31	54	85	6	3	9	37	57	
Paraguay	—	29	29	—	5	5	—	34	
Peru	213	78	291	188	174	362	401	252	
Uruguay	128	203	331	—	—	—	128	203	
Venezuela	35	621	656	—	372	372	35	993	1
Costa Rica	73	25	98	(8)	(4)	12	(81)	(29)	
Cuba	—	469	469	—	385	385	—	854	
El Salvador	56	9	65	—	9	9	56	18	
Guatemala	25	19	44	(—)	(13)	13	(25)	(32)	
Haiti	—	12	12	(—)	(15)	(15)	—	(27)	
Honduras	3	12	15	—	14	14	3	26	
Mexico	1,111	888	1,999	48	513	561	1,159	1,401	2
Nicaragua	1	50	51	—	25	25	1	75	
Panama	7	42	49	34	51	85	41	93	
Dominican Republic	—	87	87	—	(30)	(30)	—	(117)	(
Guyana	—	15	15	—	(20)	(20)	—	(35)	
Jamaica	(13)	(52)	(65)	—	56	56	(13)	(108)	(
Surinam	—	11	11	(—)	(12)	(12)	(—)	(23)	
Trinidad and Tobago	—	61	61	—	48	48	—	109	
LATIN AMERICA	*5,923*	*5,510*	*11,434*	*679*	*3,391*	*4,070*	*6,603*	*8,901*	*15*

SOURCE: ECLA, on the basis of official statistics.

In 1967, the four countries in which generation of electric energy increased at rates exceeding 12 per cent accounted for only a little over 1.7 per cent of installed capacity and generation in Latin America. On the other hand, Argentina, Brazil and Mexico, which together contain 60 per cent of the population of the region, possessed 71 per cent of its installed capacity and contributed 63.5 per cent of the electricity generated. Accordingly, developments in these three countries strongly influence regional trends. During the period under review, the average annual growth rates of generation in the three countries in question were 6.6, 6.3 and 9.8 per cent, respectively, as against 7.7 per cent for Latin America as a whole, and the rates of expansion of their installed generating capacity averaged 7.3, 8.0 and 9.5 per cent, respectively, as compared with a regional average of 8.0 per cent.

(ii) *Electricity generation per unit of gross domestic product, and per capita.* The rate of electrification of the economy, which is defined here as the difference between the growth rates of electric energy generation and of the gross domestic product, was 3.8 per cent in 1958-1967, as against 4.5 per cent in the 1950s, and 4.2 per cent between 1959 and 1963. The amount of electric energy generated per unit of product increased steadily from 0.73 kWh per dollar in 1957 to 1.04 kWh in 1967 (see table 53). The more intensive use of electric energy per unit of product is caused, as already pointed out, by a variety of factors, including, *inter alia,* the rate of industrial development, the tempo of the technical advances which increase productivity and speed up the urbanization process, and the improvement of income distribution patterns.

While the economic growth rate of the Latin American countries swung up and down from one year to another, the generation of electricity, broadly speaking, pursued a steady upward trend.

TALLED CAPACITY, 1958-1967

1967									Percentage increase 1958-67	Installed capacity per inhabitant (No. of watts)	
Public supply			*Self-supply*			*Total for the country*					
H	*T*	*Total*	*H*	*T*	*Total*	*H*	*T*	*Total*		*1958*	*1967*
409	3,467	3,876	23	1,672	1,695	432	5,139	5,571	84	152	242
121	20	141	23	55	78	144	75	219	53	40	51
344	1,456	6,800	348	560	908	5,787	2,255	8,042	101	60	93
191)	(490)	1,681	(85)	(295)	(380)	(1,276)	(785)	(2,061)	140	59	109
608	348	956	112	500	612	720	848	1,568	55	137	170
(80)	(110)	(190)	(3)	(37)	(40)	(83)	(147)	(230)	145	23	43
1	43	44	—	23	23	1	66	67	97	20	31
581)	(248)	829	(290)	(398)	688	871	646	1,517	132	69	122
236	224	460	—	—	—	236	224	460	39	136	170
380)	1,480	1,860	—	(560)	(560)	(380)	(2,040)	(2,420)	135	151	259
168	41	209	8	15	23	176	56	232	111	99	147
—	(666)	(666)	—	(444)	(444)	—	(1,110)	(1,110)	30	131	142
109	46	155	—	17	17	109	63	172	132	32	55
40	76	116	4	11	15	44	87	131	130	16	28
—	(20)	20	—	(25)	(25)	—	45	(45)	67	7	9
31	28	59	1	16	17	32	44	76	162	16	31
520	2,364	4,884	120	797	917	2,640	3,161	5,801	127	76	127
51	65	116	7	32	39	58	97	155	104	55	82
15	106	121	47	85	132	62	191	253	89	139	199
15	123	138	—	(50)	(50)	15	173	188	61	41	49
—	40	40	—	(60)	(60)	—	(100)	(100)	186	64	144
22	130	152	—	90	90	22	220	242	100	77	129
—	(40)	(40)	(190)	(50)	(240)	(190)	(90)	(280)	1,217	79	745
—	203	203	—	50	50	—	253	253	132	136	245
22	*11,834*	*23,756*	*1,261*	*5,842*	*7,103*	*13,278*	*17,915*	*31,193*	*100*	*79*	*122*

H: Hydroelectric; T: Thermoelectric.

In per capita terms, generation of electric energy in Latin America increased from 295 kWh to 451 kWh between 1958 and 1967, i.e., at annual rates which averaged 5.0 per cent, but betrayed a tendency to slacken in the later years of the period. The corresponding world averages were 671 kWh and 1,130 kWh, respectively, the annual rate of expansion being 5.9 per cent. The explanation of the slower rate of growth in Latin America lies in the relatively smaller increase in the gross domestic product (see table 54).

Wide disparities both in per capita generation of electricity and in its annual rate of increase are observable in the various countries. Chile recorded the highest per capita generation figures up to 1960, in which year Venezuela took its place in the lead. In 1967, Surinam and Trinidad and Tobago generated 2,230 kWh and 1,048 kWh per capita, respectively, thus outdoing Venezuela's 984 kWh. In all these countries there is a great deal of private production, linked to their main export lines, such as bauxite, copper, nitrate and petroleum. Eight other countries equalled or exceeded the regional average of 451 kWh per annum; Panama (930 kWh), Chile (769 kWh), Argentina (717 kWh), Uruguay (688 kWh), Cuba (543 kWh), Jamaica (538 kWh), Costa Rica (476 kWh) and Mexico (458 kWh).

A reminder should be given here of the previous remarks on the correlations between gross product and electricity consumption in 1955-1957 and 1965-1967 (see section A-2, "Consumption of energy in relation to economic and social development.").

(iii) *Consumption by sectors*. The difference between "generation" and "consumption" as recorded in statistics includes, besides the losses inherent in the transmission of electricity and the amounts consumed by the power stations themselves in the generation process, an inde-

LATIN AMERICA: ELECT

Country	1958								
	Public supply			*Self-supply*			*Country total*		
	H	*T*	*Total*	*H*	*T*	*Total*	*H*	*T*	*T*
Argentina	665	6,710	7,375	—	2,044	2,044	665	8,754	9,
Bolivia	238	17	255	95	94	189	332	112	
Brazil	16,489	1,808	18,297	995	473	1,468	17,484	2,281	19,
Colombia	1,930	520	2,450	100	500	600	2,030	1,020	3,
Chile	1,897	157	2,054	764	1,328	2,092	2,661	1,485	4,
Ecuador	(134)	(126)	(260)	(25)	(39)	(64)	159	165	
Paraguay	—	66	66	—	15	15	—	81	
Peru	630	263	893	769	349	1,118	1,399	613	2,
Uruguay	760	476	1,236	—	—	—	760	476	1,
Venezuela	138	2,112	2,250	—	(1,541)	(1,541)	138	3,653	(3,
Costa Rica	274	63	337	(17)	(11)	28	291	74	
Cuba	—	1,867	1,867	—	721	721	—	2,588	2,
El Salvador	203	3	206	—	7	7	203	10	
Guatemala	106	72	178	—	50	50	106	122	
Haiti	—	47	47	—	(43)	(43)	—	(90)	
Honduras	11	28	39	—	41	41	11	69	
Mexico	4,156	3,250	7,406	140	1,511	1,651	4,296	4,761	9,0
Nicaragua	3	68	71	(30)	(39)	69	(33)	(107)	
Panama[b]	14	158	172	232	38	270	246	196	4
Dominican Republic	—	225	225	—	59	59	—	284	2
Guyana	—	40	40	—	27	27	—	67	
Jamaica	85	123	208	—	(220)	(220)	(85)	(343)	(4
Surinam	—	22	22	—	37	37	—	59	
Trinidad and Tobago	—	186	186	—	197	197	—	383	3
LATIN AMERICA	*27,733*	*18,407*	*46,140*	*3,167*	*9,384*	*12,551*	*30,899*	*27,793*	*59,6*

SOURCE: ECLA, on the basis of official statistics.
Notes: Figures in parentheses are estimates.

H: Hydroelectricity.
T: Thermoelectricity.

terminate quantity of energy which is absorbed into economic activity as a final good or as a factor of production without being recorded, since the supply of electricity provided by the public service networks is not all properly measured.

In some small towns there is still a fixed monthly rate for each subscriber with ceilings set for demand, but with no attempt to measure the energy consumed, and surreptitious consumption by means of illicit tapping of the mains or tampering with meter readings is by no means uncommon. In properly established electricity systems, these clandestine or "unregistered" forms of consumption normally represent small percentages of total generation, but in old-fashioned distribution networks they may attain quite high figures.

Rough averages for various systems suggest that the internal consumption of generating plants amounts to 5 per cent of production, according to the size of the power stations and the prevailing type of installed capacity (hydroelectric or thermoelectric).

Thus the aggregate losses inherent in the transmission and distribution of electricity range, as a general rule, from 6 to 15 per cent; the smallest proportions correspond to systems with very short transmission lines, or none at all, and highly satisfactory distribution networks, and the largest to systems which are fed by long transmission lines, and whose distribution networks are relatively defective. At the beginning of the 1960s, losses averaged 10.0 per cent in Europe and 8.2 per cent in the United States.

RGY GENERATION, 1958-1967

er- tage are of blic pply n tal	1967[a]									Per- centage share of public supply in total	Per- cent- age annual in- crease
	Public supply			Self-supply			Country total				
	H	T	Total	H	T	Total	H	T	Total		
.2	1,188	11,191	12,379	72	4,256	4,328	1,260	15,447	16,707	74.1	6.6
.4	412	21	433	100	62	162	512	83	595	72.8	3.3
.5	27,442	3,833	31,275	1,747	1,216	2,963	29,189	5,049	34,238	91.3	6.3
.3	3,850	1,697	5,547	800	320	1,120	4,650	2,017	6,667	83.2	9.1
.5	3,456	810	4,266	799	1,826	2,625	4,255	2,636	6,891	61.9	5.8
.2	330	320	650	30	80	110	360	400	760	85.5	9.9
.5	—	116	116	—	9	9	—	125	125	92.8	4.9
.4	2,016	232	2,248	1,150	1,345	2,495	3,166	1,574	4,743	47.4	10.0
.0	1,319	585	1,904	—	—	—	1,319	585	1,904	100.0	4.9
.4	1,200	5,500	6,700	100	2,400	2,500	1,300	7,900	9,200	72.8	10.4
.3	674	28	702	18	32	50	692	60	752	93.4	8.4
.1	—	(3,050)	(3,050)	—	950	950	—	4,000	4,000	76.3	4.9
.7	426	65	491	—	25	25	426	90	516	95.2	10.3
.1	146	338	484	(12)	(35)	47	158	373	531	91.1	9.8
.2	—	(75)	(75)	—	(40)	40	—	115	115	65.2	2.7
.7	152	47	199	(2)	(31)	33	154	73	232	85.8	12.6
.8	10,440	6,989	17,429	766	2,731	3,497	11,206	9,720	20,926	83.3	9.8
.7	172	138	310	(5)	(82)	87	177	220	397	78.1	12.3
.9	52	428	480	(310)	(361)	671	362	789	1,151	41.7	11.2
.2	60	530	590	—	130	130	60	660	720	81.9	10.9
.7	—	95	95	—	135	135	—	230	230	41.3	14.7
.6	150	450	600	—	350	350	150	800	950	63.2	9.3
.3	—	79	79	690	70	760	690	149	839	9.4	34.4
.6	—	731	731	—	304	304	—	1,035	1,035	70.6	11.7
.6	*53,485*	*37,348*	*90,833*	*6,601*	*16,790*	*23,391*	*60,086*	*54,138*	*114,224*	*79.5*	*7.7*

The 1967 figures are preliminary in some cases.

[b] Canal zone included in "Self-supply".

Table 55 shows the consumption of mining and industry in Latin America and that of the residential and commercial sectors, together with losses and "Other uses", in the years 1958 and 1966. To give a satisfactory idea of the growth of industrial consumption, production by self-suppliers is taken into consideration as well, after deduction of the 5 per cent corresponding to the power stations' own consumption and of losses proper in the transformers and the distribution network. Of the regional total of 106,115 GWh generated in 1966, 15,969 GWh were written off as losses, including the consumption of the power stations themselves and "unregistered" consumption. Thus losses represented 15.1 per cent of total generation (see table 56), as against 13.8 per cent in 1958. Generally speaking, this increase is due to unsatisfactory or inadequate extensions and expansions of the transmission and distribution networks. Countries which have increased their generating capacity without strengthening their transmission and distribution services are liable to show a relative increase in losses. Between 1958 and 1966, the proportion of losses in relation to production rose in Argentina, Bolivia, Brazil, Chile, Ecuador, Uruguay, Venezuela, Cuba, Mexico, Nicaragua and Trinidad and Tobago.

The analysis of electricity consumption in the various sectors of economic activity not only makes it easier to understand the inter-country disparities in total consumption per unit of gross product, as resulting from differing economic structures, but also provides appropriate background data on which to base projec-

Table 53

LATIN AMERICA: ELECTRIC ENERGY PRODUCTION AND TOTAL PRODUCTION OF GOODS AND SERVICES,[a] 1950-1967 (SELECTED YEARS)

Year	*Electric energy generated (thousands of millions of kWh)*	*Gross domestic product (thousands of millions of dollars at 1960 prices)*	*Electric energy generated per unit of gross domestic product (kWh per dollar)*
1950	27.0	49.2	0.55
1957	51.0	69.6	0.73
1958	56.8	72.7	0.78
1960	66.3	79.1	0.84
1962	77.8	86.0	0.90
1964	93.9	93.3	1.00
1967	112.2	107.6	1.04

SOURCE: ECLA, *Economic Survey of Latin America*, 1963 and 1967 (United Nations publications: Sales Nos. 65.II.G.1 and E.69.II.G.1 respectively).

[a] Excluding Guyana, Jamaica, Surinam, Trinidad and Tobago.

Table 54

LATIN AMERICA: ELECTRIC ENERGY GENERATION PER INHABITANT, 1958 AND 1967

(In kWh per inhabitant)

Country	*Generation per inhabitant*		*Average annual growth rate per inhabitant (percentages)*
	1958	*1967*	
Argentina	471	717	4.8
Bolivia	113	135	2.0
Brazil	299	410	3.5
Colombia	209	356	6.0
Chile	559	769	3.6
Ecuador	78	142	6.9
Paraguay	49	59	2.1
Peru	210	388	7.0
Uruguay	509	688	3.4
Venezuela	555	984	6.5
Costa Rica	328	476	4.2
Cuba	397	543	3.5
El Salvador	91	166	6.9
Guatemala	62	116	7.2
Haiti	23	24	0.5
Honduras	44	94	8.7
Mexico	268	458	6.1
Nicaragua	109	213	7.7
Panama[a]	459	930	8.1
Dominican Republic	100	187	7.2
Guyana	130	332	11.0
Jamaica	274	538	7.7
Surinam	227	2,230	29.0
Trinidad and Tobago	481	1,048	9.0
Latin America	*295*	*451*	*5.0*

SOURCE: ECLA, on the basis of official statistics.

[a] Including Canal Zone.

tions of future electricity requirements, in line with over-all development plans or hypotheses.

Unfortunately, the scarcity of basic statistics, or the lack of uniformity in those that do exist, preclude as detailed an analysis as the importance of the subject demands. There are discrepancies in the ways in which the various countries classify consumption (household, commercial, industrial, street lighting, transport, etc.). Hence tables 56 and 57 above comprise industrial and non-industrial consumption, the latter being subdivided into commercial and residential consumption,[4] and "Other uses". The growth of consumption in the industrial sector is an index of the rate of increase of industrial production and productivity, while in the residential and commercial sectors it reflects improvements in the levels of living and material welfare of the population.

In 1958-1966, the average annual rate of expansion of consumption in Latin America as a whole was 6.4 per cent in the residential and commercial sectors and 8.2 per cent in industry. If Brazil, Ecuador, Paraguay and the Central American countries (except Nicaragua) are included, the average growth rate of industrial consumption falls below that of residential and commercial consumption, which would suggest, generally speaking, that standards of welfare have risen more rapidly than production has expanded. It is also true, however, that the disproportion partly reflects distortions of consumption imputable to the lack of an integrated and consistent energy policy in many countries. The chief causes of the upswing in residential and commercial consumption are the increase in the number of consumers resulting from the lengthening of networks, the more widespread use of electrical appliances in the home, and the expansion and modernization of commerce and services in line with the current trend towards urbanization. Another factor which has done much to distort the use of electricity in various sectors is the unsuitability of the structure of electricity

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[4] In several countries the statistics do not differentiate between residential and commercial consumption.

Table 55

LATIN AMERICA: DISTRIBUTION OF TOTAL CONSUMPTION, INCLUDING THAT OF SELF-SUPPLIERS, AND GROWTH RATE, 1958 AND 1966

Country	*1958*				*1966*				*Percentage growth rates, 1958-1966*			
	Industrial and mining	*Non-industrial consumption*		*Losses*[a]	*Industrial and mining*	*Non-industrial consumption*		*Losses*[a]	*Industrial and mining*	*Non-industrial consumption*		*Losses*[a]
		Commercial and domestic	*Other*			*Commercial and domestic*	*Other*			*Commercial and domestic*	*Other*	
Argentina	4,548	2,839	540	1,491	6,964	4,847	1,459	2,548	5.4	6.9	13.2	6.9
Bolivia	243	108	4	45	319	155	54	92	3.5	4.6	30.0	9.3
Brazil	6,494	6,900	3,320	3,062	14,543	8,888	3,412	5,357	10.6	3.2	0.4	7.3
Colombia[b]	1,037	1,063	260	480	2,347	2,503	571	886	9.5	10.0	9.2	7.1
Chile	2,783	586	420	357	4,204	1,012	645	801	5.3	7.1	5.5	10.6
Ecuador	111	121	41	42	294	228	80	98	12.9	8.2	9.1	11.2
Paraguay	30	30	4	18	60	58	29	23	9.1	8.6	28.0	3.1
Peru	1,424	331	41	196	2,886	841	115	343	9.2	12.4	13.8	7.3
Uruguay	462	496	60	218	570	792	55	424	2.7	6.0	—1.1	8.7
Venezuela	2,254	1,175	[c]	362	4,764	1,631	1,081	1,294	9.8	11.0[d]		17.3
Costa Rica	51	241	12	61	158	352	93	94	15.1	4.9	29.0	5.6
Cuba	1,179	1,038	156	215	1,654	1,410	320	616	4.3	3.9	9.4	14.0
El Salvador	64	72	35	42	204	82	120	78	15.6	1.6	16.6	8.0
Guatemala	88	86	15	32	209	127	103	53	11.4	5.0	27.0	6.5
Haiti	...	...	...	...	...	...	...	...	...	...	...	...
Honduras	44	17	4	15	111	34	37	22	12.3	9.0	32.0	4.9
Mexico	4,355	1,884	1,628	1,190	7,627	4,590	3,957	2,850	7.3	11.7	11.7	11.6
Nicaragua	94	32	7	17	162	70	70	56	7.1	10.3	34.0	16.1
Panama	281	91	16	54	646	126	185	91	10.9	4.2	1.8	6.7
Dominican Republic	131	91	36	26	275	263	53	58	9.7	14.2	5.0	10.6
Guyana	...	...	...	...	...	...	...	...	...	...	...	...
Jamaica	251	80	52	45	434	279	84	83	7.1	16.9	6.2	8.0
Surinam	...	...	...	...	...	...	...	...	...	...	...	...
Trinidad and Tobago	272	58	21	33	722	175	7	102	13.0	14.8	—12.8	15.2
Latin America	*26,196*	*17,339*	*6,662*	*8,001*	*49,153*	*28,463*	*12,530*	*15,969*	*8.2*	*6.4*	*8.2*	*9.0*

SOURCE: ECLA, on the basis of official data.

[a] Including consumption by power stations, i.e., 5 per cent in thermoelectric and 3 per cent in hydroelectric plants.

[b] 1957 and 1966.

[c] Included in commercial and domestic consumption.

[d] Commercial and domestic and other.

Table 56

LATIN AMERICA: BREAKDOWN OF TOTAL CONSUMPTION (INCLUDING SELF-SUPPLY), 1958 AND 1966

(*Percentages*)

Country	*1958*					*1966*				
		Non-industrial					*Non-industrial*			
	Industrial	*Commercial and domestic*	*Other*	*Losses*[a]	*Total*	*Industrial*	*Commercial and domestic*	*Other*	*Losses*[a]	*Total*
Argentina	48.3	30.2	5.7	15.8	100.0	44.0	30.6	9.2	16.2	100.0
Bolivia	60.7	27.0	1.0	11.3	100.0	51.5	25.0	8.7	14.8	100.0
Brazil	32.9	34.9	16.7	15.5	100.0	45.2	27.6	10.6	16.6	100.0
Colombia[b]	36.5	37.4	9.2	16.9	100.0	37.2	39.7	9.1	14.0	100.0
Chile	67.1	14.1	10.1	8.7	100.0	63.1	15.2	9.7	12.0	100.0
Ecuador	35.2	38.4	13.0	13.4	100.0	42.0	32.6	11.4	14.0	100.0
Paraguay	36.6	36.6	4.9	21.9	100.0	35.3	34.1	17.1	13.5	100.0
Peru	71.5	16.6	2.1	9.8	100.0	69.0	20.1	2.7	8.2	100.0
Uruguay	37.4	40.1	4.9	17.6	100.0	33.0	45.0	3.0	19.0	100.0
Venezuela	59.4	31.0	c	9.6	100.0	54.3	18.6	12.3	14.8	100.0
Costa Rica	14.0	66.0	3.3	16.7	100.0	22.7	50.5	13.3	13.5	100.0
Cuba	45.6	40.1	6.0	8.3	100.0	41.4	35.2	8.0	15.4	100.0
El Salvador	30.0	33.8	16.4	19.8	100.0	42.1	16.9	24.8	16.2	100.0
Guatemala	39.8	38.9	6.8	14.5	100.0	42.5	25.8	20.9	10.8	100.0
Haiti	...	...	...	...	...	...	...	...	...	...
Honduras	55.0	21.3	5.0	18.7	100.0	54.4	16.7	18.1	10.8	100.0
Mexico	48.1	20.8	18.0	13.1	100.0	40.1	24.1	20.8	15.0	100.0
Nicaragua	62.7	21.3	4.7	11.3	100.0	45.3	19.6	19.6	15.5	100.0
Panama	63.6	20.6	3.6	12.2	100.0	61.6	12.0	17.7	8.7	100.0
Dominican Republic	46.1	32.0	12.7	9.2	100.0	42.4	40.5	8.2	8.9	100.0
Guyana	...	...	...	...	...	...	...	...	...	...
Jamaica	58.6	18.7	12.1	10.6	100.0	49.3	31.7	9.5	9.5	100.0
Surinam	...	...	...	...	...	...	...	...	...	...
Trinidad and Tobago	70.8	15.1	5.5	8.6	100.0	71.8	17.4	0.7	10.1	100.0
Latin America	*45.0*	*29.8*	*11.4*	*13.8*	*100.0*	*46.3*	*26.8*	*11.8*	*15.1*	*100.0*

SOURCE: ECLA, on the basis of official data.

[a] Including consumption of power stations, i.e., 5 per cent in thermoelectric and 3 per cent in hydroelectric plants.

[b] 1957 and 1966.

[c] Included in commercial and domestic consumption.

tariffs in themselves, and of their level in relation to the prices of petroleum products and coal, which has encouraged the use of electricity for domestic purposes such as cooking, hot water supplies and heating. In some countries this has led to the restriction of industrial consumption because of the shortage of generating capacity, and to the fixing of unduly high prices for the industrial consumer, in order to maintain the average level of tariff rates.

Industrial consumption expanded faster than the regional average in Brazil, Colombia, Ecuador, Paraguay, Peru, Venezuela, Costa Rica, El Salvador, Guatemala, Honduras, Panama, the Dominican Republic, Jamaica and Trinidad and Tobago. Household consumption rose sharply in Colombia, Peru, Venezuela, the Dominican Republic and Trinidad and Tobago. The average annual rates of increase of residential and commercial consumption in Mexico and Nicaragua were 11.7 and 10.3 per cent, respectively, and those of industrial consumption 7.3 and 7.1 per cent. In Colombia, Uruguay and Costa Rica a higher percentage of consumption was represented by household uses than by industry in 1967.

(b) *Production trends*

(i) *Public utility services and generation by self-suppliers.* Although the public utility services account for approximately 80 per cent of electric energy production in Latin America, in many countries a significant role is played in this sector by self-suppliers, i.e., those industrial establishments which generate electric energy solely or partly for their own consumption. This private production of energy can be justified in certain cases on economic grounds (distance between power stations and consumer centres, indispensability of steam for manufacturing processes or availability of fuel as a by-product of the industry), but otherwise the operation of small generating plants causes under-utilization of installed capacity and pushes up generating costs. Industries often install generating plants of their own for want of a reliable and satisfactory public utility service. In 1967, approximately 46 per cent of industrial consumption in the region was covered by self-suppliers.

In 1958, self-suppliers possessed 26.3 per cent of Latin America's total installed generating capacity, and were responsible for 21.4 per cent of the actual generation of electric energy (see tables 51 and 52 above); in 1967, the corresponding figures were 22.3 and 20.5 per cent, respectively, so that the share of self-suppliers decreased only very slightly during the 1960s. In 1967, approximately 59 per cent of the electricity generated in Guyana was provided by self-suppliers; in Peru, 53 per cent; in Surinam, 91 per cent; in Panama, 58 per cent; and in Chile 38 per cent. This private production is linked to mining activities (bauxite, copper and petroleum) and to operations in the Panama Canal. Only in Uruguay is generation of energy by self-suppliers negligible; next in ascending order comes Costa Rica, with 6.6 per cent, and then Brazil, with 8.7 per cent.

(ii) *Utilization of generating capacity.* In 1967, the utilization factors of the hydroelectric and thermoelectric power stations in Latin America's public utility services were 4,490 and 3,150 kWh/kW, respectively. The utilization factor of total public-service installed capacity averaged 3,824 kWh/kW for the region as a whole, in the same year (see table 57). Country-by-country figures ranged from 1,975 kWh/kW (Surinam) to 4,600 kWh/kW (Brazil). Broadly speaking, this factor is lower in countries where reserve capacity is high or power stations are isolated, or where additional capacity has not been fully utilized in the course of the year. In some systems the utilization factor is low because household consumption (for lighting and cooking) predominates for a few hours of the day, while the industrial load is relatively slight.

In satisfactory interconnected systems utilization factors of 4,000 to 5,000 kWh/kW can be achieved. In many Latin American countries (including Argentina, Bolivia, Colombia, Ecuador, Paraguay, Peru, Costa Rica, El Salvador, Honduras, Mexico and Nicaragua) utilization factors fall short of the regional average.

The situation alters little if production by self-suppliers is taken into account. Considering that higher levels of generation in the existing plants would increase the enterprises' profits and would mean that fuller advantage was taken of their capacity, the public utility services should adopt systematic measures to improve their utilization factors.

In 1967, 84.2 per cent of the self-suppliers' installed capacity was thermoelectric, and produced on an average 2,878 kWh/kW; the corresponding figure for the hydroelectric capacity which made up the balance was 6,050 kWh/kW.

(iii) *Primary sources of energy for the generation of electricity.* Hitherto, the main sources drawn upon in Latin America for elec-

Table 57

LATIN AMERICA: UTILIZATION OF INSTALLED ELECTRICITY CAPACITY, 1958 AND 1967

(Hours per year)

Country	*Public supply*		*Total*	
	1958	*1967*	*1958*	*1967*
Argentina	3,462	3,194	3,109	2,999
Bolivia	3,148	3,071	3,105	2,717
Brazil	5,046	4,600	4,950	4,257
Colombia	3,889	3,300	3,555	3,235
Chile	3,846	4,462	4,089	4,395
Ecuador	3,059	3,421	3,447	3,304
Paraguay	2,276	2,640	2,382	1,866
Peru	3,069	2,712	3,080	3,127
Uruguay	3,734	4,140	3,734	4,140
Venezuela	3,430	3,602	3,688	3,802
Costa Rica	3,439	3,359	3,318	3,241
Cuba	3,980	4,580	3,030	3,604
El Salvador	3,169	3,168	2,878	3,000
Guatemala	4,045	4,172	4,000	4,053
Haiti	3,917	3,750	(3,333)	(2,556)
Honduras	2,600	3,373	2,759	3,053
Mexico	3,705	3,569	3,538	3,607
Nicaragua	1,392	2,672	1,842	2,561
Panama (including Canal Zone)[a]	3,510	3,967	3,299	4,549
Dominican Republic	2,586	4,275	2,427	3,830
Guyana	2,667	2,375	1,814	2,300
Jamaica	(3,200)	3,947	3,537	3,926
Surinam	2.000	1,975	2,565	3,000
Trinidad and Tobago	3,049	3,601	3,514	4,091
Latin America	*4,036*	*3,824*	*3,785*	*3,683*

SOURCE: ECLA, on the basis of official statistics.
[a] Canal Zone included in self-supply.

tricity production have been petroleum and water, although in some areas use has also been made of coal, natural gas and firewood. The Pathe power station, established in the State of Hidalgo (Mexico), in 1950, with an installed capacity of 3,500 kW, is at present the only one in the region which operates on the basis of geothermal energy. Argentina recently awarded a contract for the construction of Latin America's first atomic energy plant (315 mW), which will be located at Atucha, about 75 kilometres from Buenos Aires. This plant will use natural uranium and heavy water; it is expected to enter operation in 1971. The use of wind to generate electricity has been attempted only on an insignificant scale in Latin America, as in other parts of the world.

As a general rule, Latin America is likely to depend on conventional sources of energy in the future, although perhaps in the course of time nuclear and geothermal energy may be used in some areas.

Table 58 shows the percentage of total generation in the Latin American countries represented by generation of hydroelectricity in 1958 and 1967. In Latin America as a whole, hydroelectricity accounted for approximately 53 per cent of total production both in 1958 and in 1967. In the latter year the share of hydroelectricity exceeded the regional average in the following countries: Costa Rica (92.0 per cent), Bolivia (86.0 per cent), Brazil (85.2 per cent), El Salvador (82.6 per cent), Colombia (69.7 per cent), Uruguay (69.3 per cent), Peru (66.8 per cent), Honduras (66.4 per cent), Chile (61.7 per cent) and Mexico (53.6 per cent). According to an ECLA estimate worked out by very indirect methods but uniformly for the whole of Latin America, only about 2 per cent of the entire region's available potential was utilized in

1967 (see table 59). Uruguay, El Salvador and Mexico were the only countries to have used as much as 12-13 per cent of their hydroelectric resources.

Between 1958 and 1967, Brazil and Mexico installed additional capacity amounting to 2.6 and 1.5 million kW, or, respectively, 39 and 23 per cent, of the total hydroelectric capacity installed in the region during that period (6.6 million kW).

(c) *Interconnexion of systems. Transmission and distribution of energy*

In Latin America, as in other parts of the world, there is a manifest tendency to expand transmission networks and to interconnect power stations and electricity systems because of the benefits accruing from this procedure. The following are among the advantages worth mentioning: the possibility of establishing large thermoelectric power stations, with the resultant economies of scale; greater operational efficiency; saving of reserve capacity; reduction of maximum total demand through diversification of consumers and of peak-load hours in the different areas; economies deriving from the complementary operation of hydroelectric and thermoelectric plants; more reliable service, inasmuch as power stations can give one another support in emergencies; and so forth.

In Latin America, however, there are local factors which act as deterrents to the interconnexion of electricity systems, such as the diffuseness of consumer centres, the vast distances by which they are separated, and in some cases the existence of natural obstacles such as mountain barriers. In some countries the number of independent electricity companies is so large as to constitute a hindrance to the co-ordination and integration of the

Table 58

LATIN AMERICA: BREAKDOWN OF HYDROELECTRIC POWER GENERATION, 1958 AND 1967

(Percentages)

Country	*Public supply*		*Public supply plus private supply*	
	1958	*1967*	*1958*	*1967*
Argentina	9.0	9.6	7.1	7.5
Bolivia	93.3	95.2	74.8	86.0
Brazil	90.1	87.7	88.5	85.2
Colombia	78.8	69.4	66.5	69.7
Chile	92.4	81.0	64.2	61.7
Ecuador	51.5	50.8	49.1	47.4
Paraguay	0.0	0.0	0.0	0.0
Peru	70.5	89.7	69.6	66.8
Uruguay	61.5	69.3	61.5	69.3
Venezuela	6.1	17.9	3.6	14.1
Costa Rica	81.3	96.0	79.7	92.0
Cuba	0.0	0.0	0.0	0.0
El Salvador	98.5	86.8	95.3	82.6
Guatemala	59.6	30.2	46.5	29.8
Haiti	0.0	0.0	0.0	0.0
Honduras	28.2	76.4	13.7	66.4
Mexico	56.1	59.9	47.4	53.6
Nicaragua	4.2	55.5	23.6	44.6
Panama (including Canal Zone)[a]	8.1	10.8	55.7	31.5
Dominican Republic	0.0	10.2	0.0	8.3
Guyana	0.0	0.0	0.0	0.0
Jamaica	40.9	25.0	19.9	15.8
Surinam	0.0	0.0	0.0	82.2
Trinidad and Tobago	0.0	0.0	0.0	0.0
Latin America	*60.1*	*58.9*	*52.6*	*52.6*

SOURCE: ECLA, on the basis of official statistics.

[a] Canal Zone included in self-supply.

Table 59

LATIN AMERICA: ECONOMIC POTENTIAL OF HYDROELECTRICITY AND PRESENT UTILIZATION THEREOF

(mW)

Country	*Economic potential based on average river flows*	*Installed hydroelectric capacity in 1967*	*Percentage utilization of installed capacity with a 50 per cent plant utilization factor*	*Increase in installed hydroelectric capacity from 1958 to 1967*
Argentina	10,900	(432)	2.0	(137)
Bolivia	14,700	144	0.5	52
Brazil	102,700	5,787	2.8	2,615
Colombia	38,200	(1,276)	1.7	(786)
Costa Rica	2,100	175	4.2	94
Cuba	700	—	0.0	—
Chile	22,500	720	1.6	198
Ecuador	17,200	(83)	0.2	(46)
El Salvador	400	109	13.7	53
Guatemala	4,400	45	0.5	20
Guyana	4,700	—	0.0	—
Haiti	400	—	0.0	—
Honduras	3,500	33	0.5	30
Jamaica	300	22	3.7	9
Mexico	11,100	2,640	11.9	1,481
Nicaragua	2,200	58	1.3	57
Panama[a]	2,400	62	1.3	22
Paraguay	5,400	1	—[b]	1
Peru	32,700	87	1.3	470
Dominican Republic	800	15	0.9	15
Surinam	2,600	(190)	0.4	(190)
Trinidad and Tobago	100	—	0.0	—
Uruguay	900	236	13.0	108
Venezuela	34,700	380	0.5	345
Latin America	*317,200*	*13,278*	*2.0*	*6,675*

SOURCE: ECLA, "Latin America's Hydroelectric Potential", *Economic Bulletin for Latin America*, vol. XII, No. 1 (May 1967), pp. 56-62. Estimated according to the recommendations of the Latin American Seminar on Electric Energy, held at Mexico City in 1961.

[a] Including Canal Zone.

[b] Equals 0.01.

available resources. Another adverse circumstance is the existence of different technical characteristics, even within a single country. In Mexico, Venezuela, Brazil and Peru, for example, frequencies of both 50 and 60 cycles are used, having been adopted in the past to suit the interests of the private companies which were the first suppliers of electric energy in those countries. The interconnexion of such systems raises serious problems, since frequency converters would have to be installed or the frequencies in some systems altered, and these are both measures which imply heavy expenditure. Nevertheless, there is increasing awareness of the importance of standardizing frequencies and transmission voltages. Argentina, Bolivia, Chile, Paraguay and Uruguay have virtually achieved standardization at 50 cycles, while the more northerly countries have adopted the 60-cycle frequency. In Mexico, Venezuela and Brazil, some of the 50-cycle systems are being switched to 60 cycles.

It is estimated that the cost of changing over to 60 cycles in Greater Caracas would be about 22 million dollars, including consumer expenditure, and that for the Rio Light network (Rio de Janeiro) it would amount to 15 million dollars, excluding the cost of transformers for appliances owned by consumers.

(i) *Internal interconnexions.* During the 1960s, the major networks expanded considerably. The Greater Buenos Aires-Littoral system possesses a generating capacity of over 2 million kW, and serves a population of about 7,500,000 inhabitants; in 1967, these figures represented, respectively, nearly 53 per cent and 32 per cent of Argentina's total installed capacity and population.

At the present time, all the power stations in the system are thermoelectric, although in the future Buenos Aires will receive hydro power from Chocón and Cerros Colorados (in the provinces of Neuquén and Río Negro). The Chocón-Cerros Colorados power station will have a capacity of 1,650 mW, and the energy will be sent to the capital over a distance of 1,150 kilometres, via 500-kV transmission lines.

In Brazil, the South Central system, which covers the States of Minas Gerais, Espirito Santo, Rio de Janeiro, Guanabara and São Paulo, has an integrated generating capacity of 4,700 MW, which constituted 70 per cent of the installed generating capacity of the public utility services throughout the country in the year 1967, when over 18 million consumers were supplied. Since Brazil has no large reserves of fossil fuels at its disposal, it is seeking to make the most of its abundant hydroelectricity resources by interconnecting power stations and using high-voltage transmission lines to carry electric energy to the consumer centres.

The capacity of the Mexican system, which embraces the Federal District and States of Mexico, Morelos, Hidalgo and Guerrero, is also substantial. The interconnected generating capacity of this network amounts to 1,800 mW, and represents 40 per cent of the capacity of the public electricity services.

In Chile, the interconnected system covers the central zone, from La Serena to Chiloe, and its installed capacity of about 827 mW accounts for 93 per cent of the total generating capacity of Chile's public services and supplies 91 per cent of the population. The interconnexions have made for optimum utilization of the country's hydroelectric resources, since the rivers attain their maximum flows at different times of year in the central zone and in the south.

Similar trends are to be noted in Venezuela, Colombia and other countries. In Colombia a Sociedad de Interconexión Nacional has been formed by the Empresa de Energía Eléctrica de Bogotá, the Empresas Públicas de Medellín, the Corporación del Valle del Cauca (Cali), and ELECTROAGUAS, with a view to coordinating the construction of a national network of transmission lines and interconnexions.

(ii) *International interconnexions.* The benefits deriving from the internal interconnexion of their own power stations and electricity networks have incited several countries to study the possibility of interconnecting their systems at the international level. At present interconnexions exist between Uruguay and Brazil, although they are not of great significance, and the establishment of others between Colombia and Ecuador and Colombia and Venezuela is under study. Uruguay and Argentina have signed an agreement relating to small exchanges of energy in frontier areas, and consideration is being given to the idea of interconnecting the Montevideo-Río Negro network with the Greater Buenos Aires-Littoral system. The Central American republics are also looking into the possibility of integrating their respective systems.

(iii) *Rural electrification.* The proportion of rural population in the Latin American countries is large. According to estimates, 60.7 per cent of the population lived in rural areas in 1950, and 49.7 per cent in 1965. The extension of electricity supplies to rural areas makes it possible to improve the living conditions of a large sector of the population, to increase its productivity and raise its income levels, to offer employment opportunities, and to provide comforts and conveniences which will help to check the exodus of workers to the urban centres.

The Latin American countries have been increasingly concerned with this question. The vast distances between the rural population centres and the power stations, the sparseness of the population, the low load factors, the shortage of capital and the meagre rates of return on investment in rural electrification, are the source of many technical, financial and institutional problems.

In some countries, including, for example, Mexico, Brazil, Chile and Argentina, some headway has been made in the establishment of special organizations designed to promote rural electrification through municipal authorities, co-operatives, consortia, state electrification boards, and other institutions. Thanks to expansion of systems and the lengthening of transmission and distribution networks, electric energy is being supplied to numbers of rural population centres, at a reasonable cost.

(d) *Latin America's resources for electric energy production, other than hydrocarbons*

Even in developed countries like those of Western Europe, estimates of available energy resources change at the different stages of exploration and with the progress of the techniques applied not only in prospecting but also in the development and use of the resources concerned. In Latin America, research on energy resources has not been systematically conducted as a rule, and in some countries the collection of data relating to sources of hydro power is only just beginning. Knowledge of the region's resources is therefore very far from complete.

On various occasions the ECLA secretariat has drawn attention to the inadequacy of flow measurements, the want of topographical maps and the scarcity of other river data which are essential for preparing reliable estimates of the region's hydroelectric potential. Similarly, the lack of uniformity in the methods of evaluating this potential means that estimates show wide discrepancies even when made by different agencies in a single country, and are not comparable from one country to another. As a first step towards rationalizing estimates, ECLA recently prepared a very indirect estimate of the hydroelectric potential of the Latin American countries on a uniform basis.

Contour maps on a scale of 1:1,000,000 were used, and on these were drawn isohyets of average annual precipitation over a fairly long period. This information was used simply to prepare an approximate estimate of "gross precipitation potential", taking into account total precipitation and disregarding losses. The next step was to deduce how much hydroelectric potential would lend itself to economic exploitation (the possible "economic potential"), on the basis of the experience of selected European countries and using "run-off coefficients" evaluated only in certain hydrographic basins. The results are set out in table 59, which shows that the "economic potential" estimated on the basis of the mean flow might be approximately 320 million kW. Nearly one third of this potential is to be found in Brazil, 12 per cent in Colombia, 11 per cent in Venezuela, and 10.3 per cent in Peru. The remainder is distributed among the other Latin American countries.

Many countries also possess solid fuels, but most of these are not of very high grades, and mining them proves costly. In 1966, about 10 million tons of coal were mined in the whole of Latin America. Brazil's contribution to this total was 3.5 million tons, Colombia's 2.6 million, Mexico's 2.1 million, and Chile's 1.5 million. Argentina, Peru and Venezuela produced smaller quantities.

With the installation of a 3,500-kW power station at Pathé in 1956, Mexico seems to have been the second country in the world to use geothermal energy on a commercial scale. The most promising project of this type to date is one which is in process of execution at Cerro Prieto in the valley of Mexicali, in the north-west of Mexico and not far from the United States border. Several wells have been drilled in this area, and the experimental work carried out so far has revealed the possibility of constructing a plant with an initial generating capacity of some 60,000 kW.

With the help of the United Nations Development Programme (Special Fund Component), El Salvador and Chile (El Tatio) are also studying the feasibility of developing geothermal energy on a commercial scale.

Little is know of the availability of Mission fuels in Latin America. Reserves of uranium have been found in Argentina, Brazil, and Mexico, and of thorium in monozitic sand deposits in Brazil; these latter contain about 300,000 tons of thorium, i.e., 20 to 30 per cent of known world reserves of this element. At present thorium can only be used in a regeneration process, because more fissionable material is produced than is consumed; the techniques involved have not yet been fully developed for commercial purposes.

(e) *State and private enterprise in public electricity services*

It is estimated that by 1967 nearly 75 per cent of the region's installed generating capacity was controlled by the public sector (central, provincial or State governments and, in a few cases, municipal authorities). Several of the foreign electricity companies have been nationalized, and, in general, a start has been made on planning the development of electric energy on a nation-wide scale.

The following are among the various factors which help to shape this trend:

The growing official recognition of the importance of an adequate supply of electric energy for the purposes of economic development;

The inability of some of the private companies to obtain sufficient funds to expand their electricity systems, since the local authorities oblige them to conform to tariff standards that are incompatible with current rates of interest in capital markets;

The increasing emphasis laid on the multipurpose use of water resources (over and above the production of electric energy), combined with the fact that generally speaking, private electricity companies are unlikely to be in a position to provide funds for optimum integrated utilization of the resources in question;

The need to prepare far-reaching plans to augment each country's electric energy supplies and co-ordinate regional interests; and

The interest shown by specific government in providing electricity for rural areas at a reasonable cost, as a means of stepping up the employment opportunities, income and levels of living of the rural population.

In some countries, such as Argentina, Brazil, Chile, Venezuela, etc., the tendency in recent years has been for government to undertake the installation of the requisite generating capacity, while private companies make block purchases of energy and distribute it to consumers.

(f) *Economic trends in generation of thermoelectricity*

Of Latin America's total installed generating capacity in 1957, 57.7 per cent was thermal and produced 48.0 per cent of the total output of electric energy. In 1958-1967, thermal capacity in the region almost doubled, rising from 8,901 mW to 17,915 mW.

There are three types of thermoelectric plants: steam plants, where the fuel burnt is petroleum, natural or refinery gas, coal, firewood or agricultural waste; internal combustion plants, fed by gas oil or diesel or fuel oil, and, in some cases, by kerosene; and, lastly, gas turbines using natural or refinery gas, Bunker C or kerosene.

Although no exact figures are available for the installed capacity in each of these types, estimates suggest that over 70 per cent of installed thermoelectric capacity is based on steam, obtained mainly by burning fuel oil. Diesel electric groups are generally used for supplying small isolated population centres and in enterprises which generate energy for their own use (self-suppliers). Gas turbines have been installed in specific places to operate at peak-load hours, as well as in certain areas where the fuels required are cheap.

Generally speaking, thermal generating costs per kWh decreased during the 1960s, since reductions took place both in the fixed expenditure component (conditional upon investment) and in the variable expenditure component (in which the most significant item is fuel consumption).

Thanks to the technical advances achieved in metallurgy, in the construction of large forged or stamped parts, in the manufacture and adjustment of turbine blades, in heat recovery methods and in generator ventilation, steam can be used at higher pressures and temperatures, and bigger turbines and generators can be manufactured, with the consequent appreciable economic advantages in respect of both initial investment and operational performance. Improvements in technology and design relating to the boilers that provide the steam have also resulted in worth-while economies.

All these innovations have made a radical difference to electric energy generation throughout the world. In 1940, the biggest steam units for electric energy production in the United States had a capacity of 125 kW, with the sole exception of one 200-kW unit. Today power stations with a capacity of 1,000 mW are being installed, which permit of a noteworthy reduction of unit costs and a considerable saving of fuel. Although the Handy-Whitman index of construction costs rose by over 80 per cent in 1950-1960, the cost of each additional kW installed remained approximately constant. This favourable trend seems to have carried over to the 1960s.

In Latin America, too, there is a tendency to install modern units of larger size and to secure more efficient utilization of energy resources. For example, a couple of decades ago the capacity of the region's biggest steam units did not exceed 75 mW, whereas in Argentina during the past seven years several 120-mW and 250-mW groups have been installed for the Greater Buenos Aires–Littoral system. In Mexico, two units of 150 mW have already been installed in the Mexicali valley and two more are in process of installation. Colombia is studying the installation of two 66-mW units in Barranquilla in an initial stage, to be followed in a second stage by other units of 100 mW.

The approximate scale of the economies at present achieved through increases in the size of units can be seen from the following data: the cost of one kW of installed capacity drops by 20 per cent if 30-mW units are superseded by units of 120 mW, but the saving is as much as 30 per cent if the capacity of the units is enlarged to 200 mW.

Furthermore, the thermal yield (number of kWh produced per kilogramme of fuel) improves considerably as the size of the units increases. To quote a few indicative figures, thermal yields are 3.15, 3.46, 4.06 and 4.25 kWh per kilogramme of petroleum equivalent (10,700 kCal/kg) in units with capacities of 30, 60, 120 and 200 mW respectively. In other words, the implied saving on fuel is 20 per cent if capacity is raised from 30 to 120 mW, 35 per cent if the increase is from 30 mW to 200 mW.

For example, in Argentina's public services, whose thermoelectric capacity amounts to 3,500 mW, average calorific consumption, which had been 3,780 kCal/kWh in 1961, had fallen to 3,410 kCal/kWh by 1964; in Mexico, where the corresponding capacity was 2,400 mW, average calorific consumption decreased from 3,110 kCal/kWh in 1965 to 3,060 in 1967; in Chile, consumption in steam generating plants in the north was reduced from 3,920 kCal/kWh in 1959 to 3,160 in 1966. As a yardstick of how much still remains to be done in this field, it should be noted that in Europe, for the countries members of the Organization for Economic Co-operation and Development (OECD) in the aggregate, the 1965 figure was 2,871 kCal/kWh.

(g) *Volume of investment and sources of financing of public services*

During the period 1958-1967, the addition of 6,161 mW of hydroelectric capacity and 5,766 mW of thermoelectric capacity in the public electricity services, together with the expansion of the region's transmission and distribution networks, implied a volume of investment in the neighbourhood of 5,500 million dollars, over and above a further 1,500 million already invested in projects at various stages of construction which will be brought into operation in the early 1970s. The total represents approximately 1 per cent of the region's gross domestic product in the period considered. The experience of some of the European and other developed countries where electricity services are very satisfactory suggests that investment in this sector generally ranges from 1.5 to 2 per cent of the gross product.

The share of the electricity companies' investment allocated to imports of equipment and material averaged 40 per cent in Latin America as a whole, although the percentage in the individual countries depended upon the proportions of thermo- and hydroelectric capacity to be installed, and the stage of development reached by domestic industry from the standpoint of satisfying demand for equipment and material.

The following were the main sources of financing drawn upon for the above-mentioned investment:

Internal

(i) The companies' own resources, deriving from undistributed profits, financial reserves, and depreciation;

(ii) Public borrowing within the countries concerned;

(iii) Sums transferred by Federal and/or state or provincial governments;

(iv) Specific taxes earmarked for the expansion of electric energy supplies (electrification funds);

External

(v) Loans from international banks and institutions, such as the International Bank for Reconstruction and Development (IBRD), the International Development Association (IDA) and the Inter-American Development Bank (IDB);

(vi) Bilateral agreements with foreign governments and, in particular, with the United States and with the Export-Import Bank (EXIMBANK);

(vii) Commercial credits granted by manufacturing firms or consortia; and

(viii) Public borrowing on foreign markets.

In the course of the 1960s, most of the countries realized that the financial resources generated by electricity tariffs themselves ought to provide a considerable proportion of the investment required for expanding electricity systems. At the beginning of the decade, the growth of the electricity industry was seriously affected in many countries by the practice which some governments and municipal authorities adopted of fixing electricity tariff rates so low that they did not cover the total cost of the service, or even, in some cases, direct operational expenditure. Fortunately, in recent years the policies concerned have been drastically overhauled, and thus it is that several countries, including Brazil, Chile, Mexico and Argentina, have made provision for the periodic revaluation of electricity companies' assets, the inclusion of appropriate items for depreciation in their accounts, and the allowance of a reasonable rate of return on the capital invested. The application of these principles has resulted in a relative increase in electricity tariffs, which in turn has made it possible to augment the funds available for reinvestment. In Mexico, however, the corresponding national tariffs were fixed in 1962 and have remained unchanged up to now; the aim of the Comisión Federal de Electricidad has been to increase productivity and efficiency in the industry, and by this means to push up its net income. Many of the electricity companies in the region are envisaging self-financing of at least 40 per cent of their expansion programmes.

During the period 1958-1967, the International Bank for Reconstruction and Development, the International Development Association, the Inter-American Development Bank, the Export-Import Bank and other United States agencies approved loans to the Latin American countries totalling about 1,900 million dollars to finance various electricity projects. This sum represents about 25 per cent of estimated investment in the public services. It should also be noted that in the same period the sector absorbed 20 per cent of the total credits granted to Latin America by the agencies listed, and in the specific case of IBRD, almost 60 per cent.

(h) *Tariff questions*

Little or no more than a decade ago, the Latin American countries that pursued unrealistic policies in establishing electricity tariffs were numerous, but in more recent years a salutary reaction has set in.

Except in the electrochemical or electrometallurgical industries, the cost of electricity in most manufacturing or other industrial processes is a small fraction (generally not more than 3 to 5 per cent) of real production costs. Since the incidence of this factor on production costs is so slight, and additional financing for electric power development is an essential need, many Latin American authorities came to the conclusion that the consumer price of electric power ought to cover all operational and maintenance costs, reasonable expenditure on financing and a fair rate of return on investment. This view was stressed at the Latin American Electric Power Seminar held at Mexico City in 1961, as well as at a meeting of experts on bases for the electricity tariff structure which took place in Santiago, Chile in 1962.[5] The inflationary trend observable in many countries was unquestionably another determinant of the new approach.

Accordingly, Argentina, Brazil, Chile and Mexico considerably improved their price-fixing policy during the 1960s.

Chile, in its basic electricity legislation (Ley General de Servicios Eléctricos de Chile; Legal Decree No. 4, 24 July 1959), Argentina (Act No. 15336, 20 September 1960) and Brazil (Decree No. 54936, 4 November 1964) have accepted the principle of "replacement cost" in the fixing of tariff rates; in other words, the cost of works and plant in process of replacement at the time of valuation is taken into account. The Chilean law authorizes a revaluation of fixed capital, net of depreciation, every five years, in accordance with this criterion; but in addition, provision is made for yearly updating in line with an internal price index, and this adjustment covers new investment. Under the Brazilian decree, revaluation can be effected in consultation with the Commissão de Tombamento. Similarly, Peruvian legislation (Act No. 12378, 8 June 1955, and the corresponding Regulations, 5 January 1956) provides for revaluation and assessment of depreciation on the basis of the replacement cost rather than the original or historical cost.

Rates of return, as well as the bases on which they are calculated, vary considerably in the cases mentioned above. Under Chilean law, a rate of return of 10 per cent of the net fixed assets of the concessionaire is established. Peruvian law, on the other hand, fixes 11.5 per cent as the ceiling for the rate of return on the concessionaire's capital[6] (debts servicing is imputed to operational costs), but this capital does not include non-earmarked reserves deriving from undistributed profits, on which the rate of return may not exceed 8.5 per cent.

The concession agreement signed on 1 February 1962 by the Government of Argentina and the State enterprise SEGBA S.A. laid down a basis for fixing tariff rates which, in conformity with the provisions of Act No. 15336, observed the replacement cost principle. In this instance, it was stipulated that accounts and annual estimates of capital should be computed in terms of dollars. Under the agreement, tariff rates, besides financing operational costs and contributions to the depreciation and replacement fund, should yield a net profit amounting, after payment of all taxes, to 8 per cent of the figure used as a basis for calculating the rates for the year. In some of the Argentine State enterprises, the change in tariff policy was brought about by means of a mere administrative decision, without a general revision of the basic legislation governing the electricity industry. For example, Decrees No. 11016 and No. 16643 (1959), relating to the Empresa Agua y Energía Eléctrica de la República Argentina, stipulate that in fixing the average sales price an adjustment should be made to allow for an annual contribution to the expansion and replacement fund, equivalent to 10 per cent of the replacement value of the equipment and services used for operational purposes. According to Decree No. 16643 (1959), article 3, "the adjustment for the replacement and expansion fund shall be annually brought up to date with the replacement values established by the Office of the Secretary of State for Energy and Fuels". This contribution has to cover both amortization and the net return on capital.

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[5] The first of these was held under the joint auspices of ECLA, the then Bureau of Technical Assistance Operations and the Government of Mexico, and the second was sponsored by the two United Nations agencies mentioned.

[6] Including an "annual commercial profit" of 3 per cent.

In Mexico, the taking over of the industry by the government simplified the state of affairs that had existed previously, when there had been 168 tariff systems in the whole Republic, often with entirely different rates for the same service, even in neighbouring localities. The authorities adopted rates applicable to the entire country, which were brought into force on 19 January 1962. Since then no further change has been introduced. Rates were computed in such a way as to make a more substantial contribution to the financing of new projects and the maintenance of existing works. The tariff was established on the assumption of a return of 5 per cent on the basic capital assessed for tariff calculation purposes (after deduction of annual depreciation charges), plus provision for covering the normal costs of operation and maintenance of all plant. The average level of the new rates was 30 per cent higher than in 1960, which meant that the Federal Government was able to reduce its contributions to the expansion of networks and to obtain international loans for new investment on more favourable terms than in earlier years.

In Costa Rica the rate of return on investment is restricted to 10 per cent. In Brazil, it is 10 per cent of the capital, net of depreciation, but it can legally be increased in the event of a devaluation of the currency (which has in fact taken place) to a figure three points higher than the rate of interest on government bonds.

Panama allows a profit of 8.75 to 9 per cent of the capital, depending on the capital itself and on the debt situation.

The general rule adopted in Colombia specifies 8 per cent as the rate of interest on capital, plus a further 8 per cent as commercial profit.

In Paraguay, under the terms of Act 966, article 88, ANDE can determine consumer tariff rates in such a way as to obtain a net profit of not less than 8 and not more than 10 per cent of the company's net assets, after coverage of all expenditure on operation and maintenance, depreciation, debt servicing, etc. The same provision applies to private concessionaires.

Ecuador is one of the countries that have not yet established regulations for standardizing tariff rates. But the Instituto Ecuatoriano de Electrificación (INECEL) has encouraged increases in tariff rates, which were very low in the case of municipal enterprises, and has succeeded in pushing up the earnings of some companies by 30 to 70 per cent.

MAIN ENERGY PROBLEMS AFFECTING THE ECONOMY

1. *The importance of the energy sector and the need for programming*

In addition to the problem created by the rapid growth of consumption of commercial energy (mainly petroleum and electricity), there is the further difficulty that the industries responsible for meeting this demand are highly capital-intensive, a characteristic which is reflected in heavy investment. From an analysis of the situation in some of the Latin American countries—and also in the member countries of the Organization for European Economic Co-operation (OEEC) and in the United States—it may be inferred that investment requirements in this field range from 10 to 15 per cent of total national investment, approximately two thirds falling to the share of electric power.

Furthermore, huge sums are spent on capital and consumer goods for using energy, although this form of investment has been less carefully studied. For example, according to some estimates, capital investment in installed facilities, apparatus and appliances for the utilization of electricity amounts to five or six times as much as the sum total of investment in generation, transmission and distribution.

Since, in addition, these industries need highly skilled technical personnel, their expansion is a drain on the two categories of resources in shortest supply in the region: financial resources and technical resources. Obviously, therefore, research and projects must be the object of careful planning, and projections of demand and programming of supply in the field of energy must be closely related to each other and to over-all development planning.

Unfortunately, during the 1960s there were cases in Latin America in which the want of concrete programmes of action for the energy sector was manifest, or in which such programmes were completely divorced from economic reality, with the resulting serious bottlenecks, especially where electric energy was concerned. This problem is all the more serious inasmuch as it cannot be solved, as can similar difficulties in other sectors of the economy, by importing the goods of which there is a shortage, in order to restore the balance of supply and demand. The construction of power stations, and the expansion of distribution networks, even where financing presents no problem, usually takes several years. No specific statistics are available, but during the 1960s, despite a considerable improvement in relation to the preceding decade, rationing of electricity certainly occurred in several major industrial centres, where the ensuing loss in production represented a value far greater than that of the investment whereby such shortages could have been relieved.

The need to programme the development of energy as part of over-all economic and social planning also has repercussions both on provision for domestic sources of financing and on the balance of payments.

In view of the sector's substantial share in the total value of national investment and the high foreign exchange component involved (higher still in the countries where the domestic industries are least developed), it is essential to study and project requirements in local and foreign currency several years ahead, together with sources of financing for the expansion programmes. Lack of foresight or maladjustments in these respects have on several occasions held up works or brought them to a standstill, with damaging effects on the economy, in the first place through the bottlenecks caused in various fields of domestic activity by the limitation of the energy supply, and secondly through the frozen capital tied up unprofitably in the unfinished works or plants. On other occasions, in face of the unsatisfactory programming of resources to finance the expansion plans of State enterprises, government have found themselves compelled to resort to methods of financing which have aggravated inflationary pressures.

In relation to the balance of payments, it is not enough to study the supplies of foreign exchange immediately available to pay for the equipment and machinery that has to be imported for the implementation of energy development plans, and to service credits and foreign capital (in the case of petroleum exporting countries). Attention must also be devoted to the implications of the chosen programme as regards the fuels that have to be imported, or deducted from potential exports.

In those Latin American countries which are largely dependent upon imports to meet their energy requirements, especially in the shape of hydrocarbons, these external purchases have amounted to as much as 15 and 20 per cent of the total value of the country's annual imports, although these proportions are tending to decrease.

2. *Integrated energy programming*

It often happens in Latin America that plans, programmes and even development policies are drawn up separately for petroleum, coal, gas and electric power, with apparent disregard of their interdependence as integral components of the energy sector; they are interchangeable for many purposes, and, moreover, electric energy can be generated from any one of the primary sources.

Serious economic distortions have come about not only for want of unity in the planning and programming of the whole energy sector, but also because the energy policies pursued have lacked stability in some instances and adaptability to immediate circumstances in others.

It is not uncommon for countries where the share of thermal electricity in total generation is high to use their tariff systems to encourage household use of electricity for heating, despite the objections to this proceeding. The drawbacks are that to install all the requisite facilities the community has to invest, on an average, at least six times as much as would be needed to obtain the same amount of heat by the direct use of petroleum products; and what is more, the social cost of energy in the developed form of electricity, is also several times higher.[7] In addition, the foreign exchange component of investment and costs is considerably larger in the case of electric heating than in that of heating on the basis of petroleum products.

Heat being a degraded form of energy, heating by electricity is unsatisfactory from the standpoint of the energy yield at the national level, since the heat initially used in the thermoelectric power stations to produce electricity undergoes successive transformations in order to revert to the state of calorific energy with a very low aggregate yield. The process also entails heavy investment in power plants and distribution systems.

Where household use of electricity for heating was encouraged by a system of tariff rates that did not reflect the marginal costs of the service (political prices), the result was a considerable expansion of demand which it was impossible to satisfy for want of sufficient installed capacity. Unfortunately, the consequent supply restrictions affected not only such consumption as to a large extent implied "comfort" that could be done without, but also such as represented "production", indispensable for the national economy.

In some countries, moreover, misguided regulatory legislation continued to cause distortions in the structure of prices of the various forms of energy during the 1960s, although in this respect too matters have taken a turn for the better. The following are the ways in which these distortions are most commonly introduced:

(i) Systems of multiple exchange rates which subsidize imports of fuels, in order to make them more accessible to particular social groups and specific activities, seriously prejudice the utilization of domestically-produced fuels, to the detriment of the entire national economy;

(ii) The State accords subsidies to public enterprises, whose real cost to the national economy is not reflected in the prices or tariff rates of the forms of energy they benefit; and

(iii) The discriminatory tax treatment meted out to the various forms of energy is inconsistent with other features of economic policy.

3. *Insufficiency of basic data*

To judge from the projects under study, the production of electric energy will not be the least important aspect of the outstanding role which water will be called upon to play in Latin America's economic development, through its various uses. On the one hand, the rapid growth of demand which is expected to take place in practically all the Latin American countries, at annual rates ranging from 7 to 12 per cent, and on the other, the region's wealth of hydroelectric potential, knowledge of which is only superficial at present, will provide a sound economic basis for the multipurpose development of rivers. According to very broad and indirect estimates, only about 2 per cent of Latin America's hydroelectric resources are exploited today. Unquestionably, lack of the relevant information has militated against their utilization.

To determine the characteristics of a hydroelectric resource, even if only for over-all planning purposes, a minimum amount of data, both hydrological (on flows and their variations) and cartographical (including altimetric information), is indispensable. Unfortunately, there are few Latin American rivers for which a fairly liberal supply of such data is available.

It should be stressed that whereas some of the background material required for the preparation of specific projects (topographical plans, geological surveys, information on soil mechanics, etc.) can be obtained relatively quickly if the necessary technical personnel and equipment are available, this is not the case with hydrological data, which must be based on continuous observation over a long period of years. To obtain statistical information which will enable the future behaviour pattern of the resource to be reliably predicted, from 20 to 30 years are needed.

Several Latin American countries possessing hydroelectric potential have often been unable to take advantage of it because at the time when it was necessary to add new generating capacity they lacked the relevant information on which to base a project for a hydroelectric power station, and had to resort to thermoelectricity in full awareness of the fact that this alternative was less desirable for the national economy. On other occasions, countries have embarked on hydroelectric projects whose characteristics were seen to be inappropriate only after the works had been put into execution and large sums had been invested.

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[7] At a very rough estimate, in a Latin American country an enterprise supplying the public with electricity for environmental heating purposes has to invest, in order to provide one additional kW at *peak-load* hours, the equivalent of about 400-500 dollars (30-60 per cent in foreign currency), while the corresponding heater costs the consumer the equivalent of about 10 to 15 dollars.

Moreover, the design and operation of hydroelectric works must also take account of the other water requirements (for irrigation, drinking water, industrial supplies, etc.) which should be met in the same hydrographic basin, and every endeavour should be made to pool plans and operations with a view to maximizing the benefit to the community. Yet, it is still common in Latin America for the agencies concerned with the development of electricity services and with that of other services which also need hydroelectric resources to work independently of one another, with no attempt at co-ordination.

Although on a smaller scale, the shortage of general geological data to guide specific exploration for hydrocarbons is another factor which may slow up or defer the discovery and exploitation of valuable fuels. The region possesses plenty of geological maps showing the known sedimentary basins, and in some cases the oilfields in production as well. Differing degrees of detail are found in information on the areas where the possibilities of striking oil are greatest and on those which are in process of exploitation. For the most part, these geological maps contain only the findings of very general geophysical surveys. More precise and detailed geological and geophysical data are available only for small areas. Latin America has not always adopted strictly scientific and uniform methods of proving reserves. The pressing need to satisfy increasing energy consumption, or to vindicate over the short term a policy of rapid exploitation with quick returns on the capital invested, often gives rise to irrational development ventures which prove prejudicial to the final recovery of the capital. Another of the dangers inherent in the rough calculation of proven reserves is that—as has in fact frequently happened—costly infrastructure works may be undertaken on the basis of such estimates, involving investment which the value of the output obtained does not suffice to repay.

Generally speaking, the scarcity of information on hydroelectric potential and other traditional sources of energy precludes the formulation of wise development programmes and policies. Energy at sufficiently low costs is an important consideration in determining the location of certain chemical and metallurgical industries whose energy input is high.

4. *Lack of flexibility in some State enterprises*

The speed with which some State enterprises (electric energy, petroleum and coal) have been established and expanded has made for the formation of cumbersome bureaucracies. In some cases the security of tenure of senior executives has been jeopardized, with adverse effects on the continuity of activities and the diligence with which they have been pursued. Sometimes, too, political pressures have affected the engagement of personnel, producing repercussions on the size and efficiency of the plant. Furthermore, although various legal procedures have been sought that will cut through some of the red tape attaching to contracts and purchases, in many instances controls are still maintained which are necessary and desirable as means of safeguarding the financial resources involved, but which, unfortunately, retard and hamper entrepreneurial action.

5. *Petroleum (hydrocarbons)*

(a) *Lack of well-defined and stable policies*

It has been shown that throughout the petroleum industry investment requirements are heavy, and that despite the technical progress achieved in methods of prospecting, the search for new deposits of hydrocarbons is attended by a high degree of risk. Moreover, the steady growth of domestic demand and exports, while assuring the petroleum industry a market for its output, at the same time obliges it to attain a rate of expansion which it cannot modify at its own will without causing serious conflicts.

These characteristics of the petroleum industry call for very careful long-term planning of activities and programming of investment on the part of both public and private enterprises. Hence experience shows that the formulation of a well-defined, stable and integrated petroleum policy is an essential requisite for the normal development of the industry. A reasonable guarantee of continuity in respect of a set of clearly specified objectives and a body of precisely defined operational norms is a *sine qua non* if State or private enterprises, or both concurrently, are to be able to plan their work and implement their investment programmes satisfactorily. Executives in both types of enterprise recognize this need.

(b) *Shortage of financial resources*

Another problem encountered in some of the Latin American countries during the 1960s, particularly in connexion with the exploration and development of their hydrocarbon resources was that of the shortage of funds. The hazardous nature of oil prospecting has an adverse influence on investment decisions, especially if the financial resources concerned are public funds. In other sectors, those responsible for deciding upon the allocation of resources can make a reasonably accurate assessment of the benefits which will accrue to the community from a specific investment; but this is not true of the search for hydrocarbons. In the case of Treasury resources, this problem is superadded to the difficulties deriving from the usual imbalance between the requirements that pile up and the funds that are available.

Mention has already been made of the policy pursued by international credit agencies in relation to oil prospecting on the part of State enterprises.

Furthermore, the keen international competition in respect of petroleum (reflected in the downward trend of prices), in combination with a group of factors discussed under another head (in particular, the high yield per well recorded in other areas) perhaps make exploration and development in Latin America less attractive to private capital if its activities are restricted, without the compensation of any other inducement, to the sedimentary basins not yet explored. In South America, however, large deposits have recently been discovered in basins of this type.

6. *Electric energy*

(a) *Defective planning and programming*

In view of the investment involved, and the time-lag between the decision to construct an electric power station and the date on which it enters operation, projects and programmes should be carefully selected and prepared years in advance. Both the technical and the economic aspects of each project should be meticulously and objectively reviewed, in order to make sure that there is sound justification for its execution and for the order of priority assigned to it.

Admittedly, in some of the Latin American countries agencies exist which successfully perform their task of programming electricity development and punctually executing the pertinent works; but in others, unfortunately, during the 1960s the exact opposite was the case. The following are some of the criticisms most frequently voiced in this connexion.

(i) *Lack of programmes, or failure to relate programmes to over-all economic and social development plans.* Lack of foresight in the expansion of electricity systems has resulted in restrictions and rationing measures which do great harm to production. Moreover, when emergencies have arisen, the procedures selected to deal with them have not usually been the most expedient from the standpoint of the national economy, but simply the most expeditious.

(ii) *Defective engineering projects, especially in the hydroelectric field.* The projects mooted within given countries and even presented to financing agencies are sometimes no more than "ideas" for potential development The following are usually their weakest points: the hydrological premises on which they are based; the want of geological and soil mechanics data to justify the designing of dykes, canals and tunnels, load chambers, spillways power houses, etc.; the lack of analyses of procedures for the exploitation of a single river or adjacent rivers; and the absence of co-ordination between installed generating capacity and transmission and distribution facilities.

(iii) *Projects whose economic justification is ill-founded or non-existent.* Projects conceived merely as a "demonstration of technical feasibility", and economically unrealistic, are by no means uncommon. In some of the Latin American countries the electricity sector has lent itself to the presentation of spectacular preliminary projects which make a fine showing for publicity purposes but a poor one as regards economic profitability.

Another common practice has been the presentation of hydroelectric projects whose economic justification, in relation to the alternative of a thermoelectric plant, is artificially urged by adopting a low cost figure for capital (a rate of interest remote from its real opportunity cost) and a relatively inflated price for fuel.

In multiple-purpose hydroelectric developments, the situation with respect to the distribution of common costs and the scale and priorities assigned to the different uses, varies according to the criteria of the project designers, regardless of the objectivity required of decision-makers who have to satisfy a number of community needs at the same time, when these needs happen to be mutually incompatible.

In some Latin American countries, hydroelectric projects are very often conceived with a bias towards maximum utilization of water resources and somewhat wasteful management of financial resources, in face of a position which would counsel exactly the reverse, since capital is in short supply and renewable natural resources are relatively abundant.

When international financing agencies complain of the lack of projects in the Latin American countries, it is precisely to technically and economically feasible projects that they refer, i.e., to those which are presented with proper justification in both respects.

(iv) *Inadequate programming of works and financial programming.* There are many waterworks in the region, including hydroelectric plants, whose construction was started in the 1960s without a satisfactory budget and financing programme, so that instead of the project's being completed in the reasonable space of time envisaged, its execution has lingered on for many years, with the twofold disadvantage of the rise in its cost and the non-productivity of the capital tied up in it.

(v) *Redundant generation by self-suppliers induced by the inadequacy of the public services.* Generation of electricity by self-suppliers is justified in many industrial or mining activities when they are located at a long distance from the public electricity networks, or when generation of electricity forms part of the technological process itself, or when it is undertaken on a sufficiently large scale. But in many Latin American countries this form of private production expanded unduly at the close of the 1940s and—to a lesser extent—in the 1950s, owing to the shortage of capacity or the unreliability of the public electricity services. Although the situation improved during the 1960s, the problem still persists in many places, with all its unfavourable economic implications, since self-suppliers cannot take advantage of the great economies of scale which are observable in public-service power stations, in respect of both investment per kW installed and operational cost per kWh produced.

(b) *Financing requirements and the channelling of funds into the electricity sector*

One of the most serious problems with which the electricity industry has been faced in the past has consisted in the financing of its substantial needs.

Whereas the annual growth rate of the gross domestic product for Latin America as a whole averaged 4.5 per cent in the 1960s, generation of electricity increased at an annual rate of 8.2 per cent (in 1956-1966), which means that this sector developed almost—and in some countries more than—twice as fast as the economy in the aggregate.

Moreover, the marginal product/capital ratio was approximately 5.5 in the electricity sector, and in certain cases even higher, i.e., roughly double the product-capital ratio for the economy as a whole.

Thus the electricity sector, besides expanding at nearly double the pace of the regional gross product, is approximately twice as capital-intensive or, in other words, the rate of gross investment was about 3.0 to 3.5 times higher than the growth rate of income. Understandably, therefore, the development of the electricity sector constitutes a heavy burden on available investment resources; it is estimated to have absorbed the equivalent of some 8,650 million dollars in 1958-1968 in Latin America as a whole, including replacement of plant or facilities that had reached the end of their useful life. This figure represents 5.5 per cent of gross investment in the region, which averaged 15,000 million dollars yearly.

The share in question seems to be slightly higher than in the 1950s (when as a general rule it did not exceed 5 per cent), with the consequent progress in the extension of services and mitigation of the supply restrictions then prevailing; but it is still somewhat lower than the corresponding sectoral coefficient in European countries and the United States, which usually ranges from 7 to 9 per cent. Table 60 gives an idea of the scale of the relevant investment in 1958-1968.

Closely linked to the financing of electricity enterprises is the institutional and legal framework within which they operate. It has already been shown that during the 1960s several Latin American countries felt it desirable to increase State participation in public electricity services by the purchase or expropriation of privately-owned enterprises and the creation or strengthening of others owned by the government, with differing degrees of operational autonomy (Mexico, Cuba, Argentina, Colombia, Brazil, Bolivia, Paraguay, Costa Rica, Chile). Although several of these companies are based on public capital, they operate as juridical persons subject to private law (ENDESA, in Chile; SEGBA, in Argentina; FURNAS, in Brazil; ANDE, in Bolivia, etc.).

Whereas in 1960 approximately 40 per cent of public-service generating capacity belonged to private companies, by the end of 1968 only

Table 60

LATIN AMERICA: ESTIMATED[a] GROSS INVESTMENT IN ELECTRICAL PLANT AND EQUIPMENT, 1958-1968

Country	*Net capacity added (thousands of kW)*	*Estimated gross investment (millions of dollars)*
Brazil	4,680	2,200
Mexico	3,720	1,700
Argentina	3,070	1,500
Venezuela	1,460	720
Colombia	1,440	670
Peru	1,060	500
Chile	610	330
Central America	615	330
Other Latin American countries	1,139	700
TOTAL	*17,794*	*8,650*

SOURCE: ECLA.

[a] Estimated on the basis of net potential added and calculations of renewals of outworn plant and equipment, and of the normal delay between the time when funds are invested in the expansion of electricity systems and the time when the new installations begin to operate.

25 per cent was in private hands (almost all in Brazil, Venezuela, Peru and Chile), although in the interval private enterprise increased its generating capacity by over 1 million kW.

In distribution to consumers private enterprise has retained a larger share, purchasing energy in increasing proportions from government enterprises.

The main sources of financing for the electricity sector are State contributions, credits, inflows of new private capital and self-financing (reinvestment of profits, amortization and reserves).

State contributions generically include those of central governments, state or provincial governments and municipal authorities. Resources have been obtained both from over-all budgets and from specific taxes earmarked for electrification funds (in Argentina, Brazil, Peru, etc.). These contributions are limited not only by the similarly limited volume of fiscal revenue, but also by the requirements of other essential sectors. Cases have arisen in which the implementation of electricity programmes has been considerably held up by delays in the receipt of the scheduled State contributions to their financing. Moreover, the specific taxes applied, for example, to the sale of electricity itself, raised the price per kWh and were tantamount to an increase in tariff rates.

Owing to the special features of the electricity sector, bank credit for this activity is provided almost exclusively by government development banks or agencies (such as the Banco de Crédito Industrial in Argentina, the Banco Nacional de Desenvolvimento Económico in Brazil and the Nacional Financiera S.A. in Mexico), or by international financing institutions or State agencies in the industrialized countries (such as the International Bank for Reconstruction and Development (IBRD), the Inter-American Development Bank (IDB), the Export Import Bank (EXIMBANK), and the United States Agency for International Development (AID)). Naturally, external credits have been conditioned by the financing capacity of the institutions concerned, and by the fact that they are mainly intended to finance expenditure in foreign currency, which used to average about 40 per cent of the total cost of electricity works in Latin America. However, as the share of domestic industry in the supply of material and equipment for electricity systems steadily increases (particularly in Argentina, Brazil, Mexico and Chile), foreign currency requirements are gradually being reduced.

Accordingly, it is felt that IBRD and IDB have taken an important step in recent years by allowing some of the resources they provide to be used, in certain cases, for purchasing local material and equipment (through invitations for tenders open to international competition), domestic industries being guaranteed protection amounting to not more than 15 per cent of the price of the imported products. Likewise, in special cases, and provided that the submission of tenders is open to international competition, these banks have agreed to finance the total cost of entire projects.

The foreign loans granted for electricity development in Latin America in 1958-1967 reached the following totals:

	Millions of Dollars	
IBRD	1,300	(as of 30 June 1967)
IDB	225	(as of 31 December 1967)
United States Export-Import Bank	186	(as of 31 December 1966)
Other United States Government Agencies	191	(as of 31 December 1967)

Consequently, these international credit agencies financed a little under one fourth of the total investment estimated for the region as a whole in the period indicated.

It is of interest to note that of the total loans granted by IBRD to Latin America in those ten years (2,200 million dollars), 59 per cent was used for public and private electricity projects.

Very little recourse has been had to the issue of bonds on capital markets. In 1966, the Comisión Federal de Electricidad de México issued, for the first time, unendorsed bonds amounting to the equivalent of 20 million dollars (in European units of account) which were subscribed in Europe, with the inclusion of some local savers.

Suppliers of equipment and machinery also grant credits, but the amortization periods are relatively short as a rule, although an improvement is taking place in this respect.

With very few exceptions, among which the most outstanding is C.A. La Electricidad de Caracas, privately-owned electricity enterprises in Latin America are chiefly based on foreign capital. Although detailed information is not available on this point, the inflow of new capital accruing from the issue of shares in the countries of origin does not seem to have been very considerable, in relative terms, during the 1960s.

As has often been pointed out, tariff rates, which are closely linked to self-financing, are the crux of the electricity industry's main problems: the scale of demand for electricity depends upon the price charged for it, and so does ability or inability to finance expansion. Besides determining how far the industry can base its development on its own resources and attract voluntary savings, the level of tariff rates also makes it easy or difficult to obtain credit.

Inflation has had very unfavourable repercussions on the financing of electricity companies, not so much through the rise in operational costs, but mainly in so far as investment costs are affected. Generally speaking, increases in tariffs have been determined by the authorities as a result of changes in fuel and labour prices rather than on the basis of revaluation of assets (return on capital, depreciation, etc.).

Fortunately, the approach which during the 1950s stressed the social significance of the supply of electricity as a motive for keeping down tariffs, and which in essence was an obstacle to the development of the industry, gave way to a sounder and more realistic attitude in the 1960s.

Under the aegis of new electricity legislation[8] the financial stability of State and private enterprises was restored, and with it the confidence of investors and credit agencies.

Those features of the new legislation which have favourably influenced the development of the electricity industry relate to the establishment of its controlling authorities, the rates of return on capital accorded, the valuation and revaluation of remunerable investment (where inflation exists), plant depreciation rates, revision of tariffs and procedures for raising them, etc.

Generally speaking, the result in both State and private enterprises has been an increase in the proportion of self-financing (reinvestment of profits, amortization and reserves), which in some countries has reached levels similar to those recorded in developed countries in the Western Hemisphere (40-50 per cent). This has alleviated the problem of obtaining money on the region's capital markets and the struggles of national Treasuries to meet the economic needs of a number of sectors at the same time. It should be noted that where a high rate of expansion must be ensured, financing programmes with the enterprise's own resources is a difficult matter.

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[8] The following are cases in point: *Peru*: Act. No. 12378 (8 June 1955), and the corresponding regulations (5 January 1956); *Chile*: Ley General de Servicios Eléctricos de Chile (Legal decree No. 4, 24 July 1959); *Argentina*: Decrees No. 11016 and No. 16643 (1959), Act No. 15336 (20 September 1960), and the SEGBA S.A. Concession Agreement (1 February 1962); *Mexico*: the national electricity tariffs which came into force on 19 January 1962 raised the average level of rates by approximately 30 per cent in relation to those applied in 1960. *Brazil*: Decree No. 54936 (4 November 1964).

OBJECTIVES

It is for each country to formulate its own policies in line with its individual needs and problems, and to make a continuing analysis of any circumstances which may in the course of time, render adjustments or modifications advisable. There are three main objectives, however, on which choice unanimously lights: (*a*) to obtain sufficient supplies of energy in its various forms for the maintenance and promotion of economic development; (*b*) to guarantee that the supply will be reasonably reliable; and (*c*) to reduce the social costs of supplying energy to a minimum and bring it to the consumer in its various forms, at appropriate prices.

There is a close and positive relationship between the fulfilment of these aims in the energy sector and the pursuit of objectives of general interest in the economic and social fields, i.e., steady development, high employment indexes, price stability and balance-of-payments equilibrium.

The first of the objectives for the energy sector signifies that requirements in respect of the various forms of energy must be constantly foreseen long enough in advance to keep supply just slightly ahead of demand. A policy which kept it too far in the lead would entail —because of the high capital-intensity of the energy industries—over-concentration of financial and technical resources in a single sector, a luxury which the Latin American countries cannot afford.

The reliability of the supply which constitutes the second objective implies that the continuity of energy supplies can be guaranteed with a high degree of probability both in the event of international conflicts (such as arose in connexion with the blockage of the Suez Canal) and in the case of difficulties within the country concerned (for example, a period of drought where the electricity system is primarily hydroelectric). The diversification of sources of supply by origin and nature may be desirable from the standpoint of assuring supplies, but the cost of the risk involved should be carefully examined in each case, since in obtaining very high reliability coefficients the costs incurred may be prohibitive.

The third objective means that each country must seek the optimum structure of types of energy and sources of supply which, while meeting economic and social development needs, will cost in the aggregate the minimum compatible with real requirements. The emphasis laid on the concept of "social costs" is intended to suggest that costs should be evaluated in terms of the real value to the community as a whole represented by the factors involved.

The statement that the various forms of energy should reach the consumer at appropriate prices is meant to underline the tremendous importance of the over-all level and the structure of energy prices for the different categories of consumers concerned.

The provision of energy at minimum social costs, however, is not always compatible with the aim of supplying it at low prices. In this case, decisions as to which objective should be given priority will have to be carefully weighed. For example, coal mines facing strong competition, mainly from hydrocarbons (or from higher-grade coal imported for the iron and steel industry), usually have problems of overproduction and high relative costs. Countries in which this difficulty arises prefer to keep up their production of coal, even if consumer prices for energy from this source are relatively high, rather than to curtail it and endure the grave social consequences of disemployment in the mines affected.

Given that the energy industries are peculiarly flexible by virtue of the interchangeability of the various forms of energy, and that they are highly capital-intensive, an irrational price structure produces consumer reactions which may imply substantial over-investment incompatible with the region's shortage of capital. Attention has already been drawn to the economic irrationality noted in some countries which establish low tariffs to encourage the use of thermoelectricity for household heating.

Again by way of examples it should be recalled that the application of unduly low rates by State enterprises has become a means of indirectly subsidizing electricity consumption in the residential sector, including that of high-income groups, with revenue accruing from more or less regressive taxes.

Wise pursuit of the objectives outlined above would lead to the exploration and exploitation of local energy resources to the fullest extent permitted by the respective social costs.

A general idea of the predictable growth of consumption of hydrocarbons and electric energy in Latin America in the 1970s, and of the order of magnitude of the corresponding investment, is given under separate heads in the sections which follow. Estimated investment totals about 39,000 million dollars (for 1970-1979), of which approximately two thirds will be allocated to electric energy.

As a necessary supplement, the prospects for non-traditional sources of energy in the Latin American countries during the 1970s are briefly reviewed.

1. *Petroleum*

(a) *Estimated volumes of internal and external demand exports*

In discussing future trends in consumption of hydrocarbons in Latin America, a distinction must be drawn between demand linked primarily to economic development and demand deriving from the substitution of one form of energy for another, in particular the displacement of the non-commercial types. It must not be forgotten that these two determinants of the expansion of consumption overlap each other to some extent.

Under the first head comes the natural growth of demand deriving from the expansion of production and from increases in disposable income. The latter will probably be of moderate proportions for Latin America as a whole in 1975-1980, since there are not likely to be sweeping structural changes in the *status quo* or spectacular income redistribution. The income-elasticity of demand will undoubtedly remain high in the case of hydrocarbons, although probably not quite as high as in the early 1960s.

Apart from the sector's direct dependence on the economy as a whole and on individual sectors of activity, commercial forms of energy have their own mainsprings of growth, which also involve indirect economic components and technological factors. Many of them operate in the field of electricity, where trends towards substitution of electric energy for hydrocarbons are emerging, mainly as a result of the development of hydroelectricity and the probability that a few nuclear plants will be installed. This may affect consumption of hydrocarbons, or at least alter its structure where petroleum products are concerned. It should be borne in mind that the generation of thermoelectricity accounted for 20 per cent of total consumption of hydrocarbons in Latin America in 1965, and that this proportion would rise to 35 per cent if, as is logical, gasoline were excluded.

Although the position of non-commercial fuels is not very clear, their importance in the Latin American energy picture must not be underestimated. Particularly important among industrially processed wood wastes is sugarcane bagasse, consumption of which was estimated at some 10 million tons of petroleum equivalent in 1965. Adding this to other industrial wastes, such as oil cake, sawdust, etc., it may be reasonably assumed that the total accounts for as much as 10 per cent of energy consumption for industrial purposes in the region, expressed in calories.

Recent trends indicate that the replacement of hydrocarbons in industry by these fuels, chiefly bagasse, is proceeding fairly rapidly and may be expected to accelerate during the period 1975-1980.

Wood is being used to a very limited extent in industry and has virtually disappeared in railway uses. The consumption of charcoal, which is still being used in the iron and steel industry, will probably stagnate given the possibilities of replacing it with natural gas, produced locally or imported in liquid form, or naphtha gas.

Even in rural areas, the widespread use of such fuels as kerosene is tending to lower domestic consumption of vegetable fuels. The change-over has been more radical in urban areas with the introduction of liquid gas, even in small towns. In the large urban centres, the growth of liquid gas consumption reflects not only the replacement of kerosene and non-commercial fuels but also making good the energy shortfall that would have been supplied with piped gas if gas supply systems had expanded as urban areas grew. This substitution process, however, appears to be slowing down to a more reasonable pace.

These factors will have an impact on both total consumption of hydrocarbons and the probable structure of consumption.

There are a number of areas where there is competition among the hydrocarbons which have collectively displaced or are displacing charcoal and wood in the domestic sector and are taking over the residual margins of coal, wood and industrial wastes in industrial and railway uses.

In this connexion, the following trends can be distinguished:

Domestic sector

1. Liquid gas replacing kerosene.
2. Piped natural gas replacing kerosene, liquid gas and fuel oil (heating).

Thermoelectric power generation

1. Natural gas replacing fuel oil.

Transport

1. Gas oil replacing fuel oil.
2. "Jet" kerosene replacing gasoline.

Industry and mining (including the petroleum industry)

1. Natural gas replacing fuel oil.

It should be noted that in the domestic sector, and in the thermoelectric power generation and industry sectors the natural gas may be in liquid form and imported from within Latin America by countries not producing natural gas on a commercial scale, or from other areas.

Because of the volumes involved and the speed of the phenomenon, the takeover of hydrocarbons is most evident in thermoelectric power generation, industry and mining; although it is still of some size in the domestic sector under point 1, and more recently under point 2.

The process has had less effect on transport but it is being felt increasingly.

The initial upsurge in the use of the natural gas and liquid petroleum gases has now levelled off, and future growth will probably be less rapid, although still more rapid than the growth of the use of petroleum. While it is still not yet certain what effect liquid natural gas will have on the structure of hydrocarbon consumption in the future, its use necessarily will increase in the long term since consumption in some countries will have to change over to the new fuel.

Moreover, in the iron and steel industry, the major high furnaces in the region are already using injected fuel oil with a consequent saving of coal, and it may be expected that this trend will be followed in other furnaces, although on a smaller scale. In addition, since there is less and less incentive to produce coal gas, hydrocarbons are being used to an increasing extent in the chemicals industry.

However, in virtually all areas competition will probably be marginal or at least not very significant, the only possible exception being competition between fuel oil and natural gas in the electricity sector over the medium and long term in hydroelectric and nuclear plants.

Taking account of the above, projections were made to estimate hydrocarbon consumption in Latin America around 1980. In order to determine orders of magnitude, the variations in consumption of petroleum products were compared with variations in the gross product and the industrial product over a long period. The respective elasticities were calculated for Latin America as a whole. In addition, individual projections were made for the main consumer countries, by products. For space reasons, these projections are not included in the present text.

The projections of consumption of individual products for Latin America as a whole, based on their performance in the various sectors of economic activity using them and the possibilities of substitution, indicate that the cumulative annual rate of growth, in terms of petroleum equivalent, will probably be close to 6.5 per cent. The projections were based on past trends assuming reasonable increases in the growth rate of the gross product.

Consumption was also projected by countries and by products. These figures indicate that liquid gas and gasoline should have the most rapid rate of growth. The estimated annual rate for liquid gas ranges from 7.7 per cent in 1965-1970 to 6.5 per cent in 1975-80. Fuel oil, which has probably now passed through the most difficult stage of competition with natural gas, shows a rising trend with a projected annual growth rate of 4.5 per cent during the period 1965-1970, rising to slightly over 5 per cent for the period 1970-1980.

The prospects for fuel oil are linked to the performance of natural gas consumption, which is expected to continue to grow rapidly during the remainder of the 1960s and then to level off at an annual rate of 5.5-6 per cent around 1980. It may reasonably be expected that these country figures are conservative and constitute a minimum in the range of possible consumption targets. Moreover, the volume and structure of consumption may be appreciably modified by the conditions of local or neighbouring supply and the limitations imposed by shortages of foreign exchange.

It should be noted, then, that the projections given in the present paper are merely indicative and not intended to constitute any kind of programme, for which much more detailed and lengthy study would be required.

Table 61 shows the results of the individual studies using metric units. The growth of consumption of each product is uneven and generally follows the most recent trends. As noted, however, it is anticipated that the decline in fuel oil consumption and the extremely rapid growth of liquid gas consumption will both level off. Compared with 1965, gasoline and intermediate products should increase their share in total consumption of hydrocarbons by 1980, chiefly at the expense of fuel oil and kerosene for domestic use.

Consumption of petroleum products in the region, which amounted to 82 million cubic metres in 1965, is expected to reach 104 million in 1970 and 161 million by 1980, i.e., it should double between 1965 and 1980 (at an approximate annual growth rate of 5 per cent). It is anticipated that natural gas consumption will triple over the same period, rising from 20,000 million cubic metres in 1965 to 64,000 million in 1980.

Table 61

LATIN AMERICA: GROSS DOMESTIC CONSUMPTION OF PETROLEUM PRODUCTS[a] AND NATURAL GAS, 1961-1965, AND PROJECTED CONSUMPTION FOR 1970, 1975 AND 1980[b]

Product	*1961*	*1962*	*1963*	*1964*	*1965*	*1970*	*1975*	*1980*
Liquid gas	2,987	3,594	4,231	5,058	5,750	8,000	10,000	12,000
Gasoline	20,680	22,033	22,816	24,643	25,552	34,000	44,000	56,000
Kerosene	6,703	7,070	6,822	7,050	7,098	8,500	10,000	12,000
Gas oil, Diesel oil[c]	11,340	13,060	14,573	15,684	16,102	22,000	28,500	36,000
Fuel oil	23,464	23,196	22,849	24,097	24,085	27,500	32,000	38,000
Fuels	*64,145*	*68,963*	*71,282*	*76,554*	*78,537*	*100,000*	*124,500*	*154,000*
Non-combustible oils	2,555	3,068	3,016	3,450	3,396	4,500	5,500	6,700
Losses, ships' bunkers, etc.	12,772	12,621	12,611	13,733	14,139	16,500	21,000	27,300
Total liquid hydrocarbons	*79,472*	*84,652*	*86,909*	*93,737*	*96,172*	*121,000*	*151,000*	*188,000*
Natural gas	11,987	15,331	16,187	18,307	20,193	35,000	49,000	64,000

SOURCE: ECLA, on the basis of official statistics and of estimates.

[a] Including consumption of the petroleum industry itself and excluding ships' bunkers, which are taken into account in the over-all balances (ST/ECLA/Conf.26/L.3, section 2).

[b] Data lacking for Cuba, Jamaica, and Trinidad and Tobago.

[c] In the case of Haiti and the Dominican Republic, these data are included under "Fuel oil".

The relative share of individual countries in total hydrocarbon consumption in the region is not expected to change a great deal by 1980.

The fact that the structure of consumption will possibly alter in some countries may have an impact on future programmes for the establishment of national refineries and also on eventual regional trade in surpluses. To deal with this it will be necessary to develop flexible schemes covering the specifications for crudes and refining in all countries.

This may be of special importance for Central America, and also for some areas in the southern part of the continent where it will depend to a very large extent on what happens if a major gas-pipeline system is established to transmit natural gas from Bolivia to certain of its neighbours.

Moreover, account must be taken when considering possible modifications in the structure of hydrocarbon consumption, of the impact of intensive use of liquid natural gas; and in this respect important markets such as Brazil are worthy of special attention.

Table 62 shows a balance sheet of the consumption of crude petroleum for domestic consumption and export, with projections to 1980. The figures given include wastage in petroleum processing and the portion corresponding to petroleum products not used as fuels. The figures for exports include supplies of fuels to shipping.

In preparing the data for this table, Venezuela, Aruba and Curaçao were considered as a single unit, so that the figure for crude petroleum exports does not include the amounts shipped from Venezuela to the two islands.

(b) *Investment requirements*

Such figures as can be developed on future capital requirements are very provisional and subject to appreciable correction.

Generally speaking, the estimates given are based on the ratio of capital invested to increases in production over the past ten years. The results were obtained from such direct information or investment estimates as could be obtained.

The investment projections were undertaken on the basis of the production, refining and demand projections presented earlier.

Average world investment per barrel/day of output, excluding the United States, Canada and the socialist countries, falls into the following ranges:

Production	800 to 1,100 dollars (including 180 dollars for non-capitalized exploration costs)
Refining	500 to 600 dollars
Marketing	550 to 650 dollars

The corresponding figures for Latin America, according to preliminary ECLA estimates based on the data available, are:

Production	730 to 3,600 dollars (an average of 2,500 dollars)
Refining	500 to 1,400 dollars (an average of 820 dollars)
Marketing	600 dollars

These figures were obtained from a study of annual investment over a reasonably long period. Exploration costs are included under the head of production.

The main objection that springs to mind regarding the usefulness of these figures for projecting future investment is that exploration costs cannot be completely correlated with output. It would perhaps be more useful to obtain a reasonably close estimate of the average cost of finding petroleum deposits in the region, and on the basis of this make a separate estimate of the cost of the exploration required to maintain proven reserves at a satisfactory ratio to a given level of production. However, when analysing Latin American investment it was found that it is practically never possible to separate exploration from production costs, and it is not always known how much of increases in reserves are attributable to new discoveries. Thus it is virtually impossible to obtain even a very rough idea of what it costs to prove reserves.

Exploration costs are very much a random variable in the projections, as can be appreciated from the following data: 200 million dollars were invested in exploration between 1938 and 1963 in three South American countries without economically viable deposits being located.

For want of more specific data, therefore, it is necessary to use a coefficient covering both exploration and production costs.

The disparity in costs between the world as a whole and Latin America, especially with respect to production and refining, is a reflection of the low output per well in the region and the low level of development of the petroleum industry in the various countries. Exploration and production costs in Latin America come close to the world average as regards

Table 62

LATIN AMERICA: BALANCE SHEET OF CRUDE PETROLEUM REQUIREMENTS FOR DOMESTIC CONSUMPTION AND EXPORT, 1961-1965, AND PROJECTED REQUIREMENTS FOR 1970, 1975 AND 1980

(Thousands of cubic metres)

Description	*Data and estimates*					*Projections*		
	1961	*1962*	*1963*	*1964*	*1965*	*1970*	*1975*	*1980*
1. Crude required for consumption	79,472	84,652	86,909	93,737	96,172	121,000	151,000	188,000
2. Availabilities of crude (a + b — c)	*170,526*	*185,737*	*190,498*	*202,106*	*212,599*	*255,000*	*300,200*	*354,200*
(*a*) Crude produced	228,242	248,069	253,403	264,015	269,752	320,400	374,600	435,400
(*b*) Crude imported	27,801	32,139	34,782	39,396	44,745	52,600	61,000	72,400
(*c*) Crude exported	85,517	94,471	97,687	101,305	101,898	118,000	135,400	153,600
3. Crude available for export as petroleum products (2-1)	*91,054*	*101,085*	*103,589*	*108,369*	*116,427*	*134,000*	*149,200*	*166,200*
4. Balance of petroleum products in terms of crude	*88,803*	*99,257*	*103,905*	*108,365*	*114,989*	*130,400*	*146,600*	*164,500*
(*a*) Imports	13,967	10,986	8,714	10,089	10,596	8,900	9,400	9,800
(*b*) Exports	102,770	110,243	112,619	118,454	125,585	139,300	156,000	174,300
5. Amount of crude processed	179,554	195,995	202,099	210,001	222,063	259,350	306,200	362,500

SOURCE: ECLA, on the basis of official statistics and of estimates.

starting production in new areas. Investment in refining approaches the cost for new refineries. Investment in marketing generally follows the world pattern, for obvious reasons.

Unit investment varies a great deal from country to country in Latin America, depending on the level of development of the industry. Except for Venezuela, it is always above the world average, with a very few exceptions such as Colombia and Mexico.

In Brazil, investment is still at the high level required for initial investment and the development of the production infrastructure and Bolivia is in much the same position.

In Argentina, Ecuador and Peru, the main reason behind the high level of unit investment in production may well be the extremely low level of output per well and the resulting high costs of drilling per unit of output.

The cost of investment in refining varies depending on the degree of complexity of the installations. Although these are not very complex at present in Latin America they will become more so in the future. As refining capacity is developed, investment per unit of output tends to fall, mainly because less investment is required to increase capacity.

Table 63 gives estimated orders of magnitude for the demand for capital to develop the petroleum industry in Latin America over the period 1966-1980. The figures represent gross investment, i.e., they include depreciation. It was assumed that the cost of capital goods would remain constant, given that the tendency for costs to rise is counterbalanced by lower total capital expenditure.

The data for the most recent period were adjusted in the light of the information available for investment under way.

The figures for pipelines and sea and inland waterway transport were taken from direct information and from specialized publications, as were the figures for the main headings of natural and liquid gas not included under other heads.

Table 64 shows investment trends during the period 1956-1965 and projected trends to 1980. The total projected for the 1970s amounts to 16,150 million dollars.

The total given for the period 1966-1970 is close to 35 per cent higher than that for 1960-1965. The total for 1966-1975 is more than 30 per cent higher than that of the preceding ten-year period.

However, a comparison of the five-year periods projected shows that the growth rate is expected to fall off, decreasing to 20 per cent in 1971-1975 and approximately 15 per cent in 1976-1980, compared with earlier periods.

This is attributable to changes in the distribution of regional production by countries. Venezuela accounted for 627,000 of the 889,000 barrels per day increase in production in 1960-1965, but is expected to account for only 415,000 of the projected increase of 870,000 barrels per day during the period 1966-1970. Since unit investment in Venezuela is much lower than in all the other countries of the region, the total amount of investment anticipated is obviously fairly high. However, throughout the period it is expected that production increments will roughly follow past

Table 63

LATIN AMERICA: ESTIMATED GROSS INVESTMENT IN PETROLEUM AND GAS, 1966-1980

(Millions of dollars)

	1966-1970	*1971-1975*	*1976-1980*	*1966-1980*
Exploration and production	3,850	4,560	5,200	13,610
Refining	990	1,430	1,700	4,120
Marketing	560	680	850	2,090
Pipelines	260	80	80	420
Sea and inland waterway transport	120	80	100	300
SUBTOTAL	*5,780*	*6,830*	*7,930*	*20,540*
Natural gas	580	600	700	1,880
Liquid gas	70	50	40	160
TOTAL	*6,430*	*7,480*	*8,670*	*22,580*

SOURCE: ECLA estimates.

Table 64

LATIN AMERICA: ANNUAL GROSS INVESTMENT IN PETROLEUM AND GAS, 1956-1980

(Millions of dollars)

Year or period	*Exploration and production*	*Refining*	*Pipelines*	*Sea and inland waterway transport*	*Marketing*	*Gas*[a]	*Total*
1956	565	230	45	8	80	...	928
1957	811	245	95	15	90	...	1,256
1958	820	160	135	34	110	...	1,259
1959	785	170	205	20	115	9	1,304
1960	691	171	147	51	125	212	1,397
1956-60	3,672	976	627	128	520	221	6,144
1961	645	178	62	12	190	52	1,139
1962	554	123	62	7	110	62	920
1963	506	152	36	16	85	68	863
1964	425	220	25	10	80	102	862
1965	500	135	25	7	85	101	853
1961-1965	2,630	810	210	52	550	385	4,637
1966-1970	3,850	990	260	120	560	650	6,430
1971-1975	4,560	1,430	80	80	680	650	7,480
1976-1980	5,200	1,700	80	100	850	740	8,670

SOURCE: ECLA estimates.

[a] Natural gas and liquid gas not included under other heads.

trends as regards Venezuela's share in regional production.

This can be clearly seen from a look at investment in production only, which is 40 per cent higher for 1966-1970 than for 1961-1965.

There is little variation in the share of the various sectors between 1961-1965 and 1966-1970, although the share of production tends to be slightly above the 1961-1965 level during the period 1966-1980.

No projections are available covering the world as a whole during the period 1966-1980 with which these regional projections could be compared. However, investment by the world petroleum industry, excluding the United States, Canada and the socialist countries, is expected to amount to 36,000 million dollars in the period 1965-1969. Latin America's share is probably about 16 per cent, on the basis of the figures given here, which is a decline of roughly 1 per cent over the period 1961-1965.

Some data are available, however, on recent United States investment in Latin America. This investment amounted to slightly over 1,100 million dollars in the period 1966-1968; and a reasonable assumption would be that it will amount to 1,000 million in the period 1969-1970. Thus, foreign investment from the United States alone will probably amount to 2,100 million dollars, or 36 per cent of all petroleum investment expected in Latin America during the period 1966-1970. This can be compared with the figure of roughly 40 per cent for total foreign investment in the past.

The total amount of investment required for the period 1965-1980 reaches unprecedented heights in the development of the petroleum industry in Latin America, excluding Venezuela, and will mean that most countries will have to tackle enormous problems.

The position with regard to capital formation in the industry in the various countries is not well known. In the aggregate (disregarding the varying degrees of distortion resulting from inflation), reserves for depreciation may supply up to 20 per cent of the industry's capital needs. If foreign capital is available in roughly the same proportions as hitherto, funds should be available to finance approximately 55 per cent of the investment required. Efforts to finance the remainder should be based on a careful analysis of policies relating to prices, the reinvestment of profits, and internal and external sources of medium- and long-term credit—topics which for space reasons cannot be gone into here.

2. *Electric energy*

(a) *The demand for electric energy in 1979*

Leaving aside the question of what is the most appropriate method of projecting electricity consumption by countries during the 1970s, it is possible to estimate orders of magnitude for electricity as a final consumption good in terms of the growth of the gross manufacturing product and the degree of electrification, and as a factor of production in terms of the level of personal income, its distribution, and the degree of urbanization.

An extrapolation of the data for the period 1956-1965, which can be taken as fairly representative of average trends, indicates that electricity generation should amount to 295,000 million kWh in 1979. This figure, however, should be considered as a minimum, partly because, although restrictions on public supply services have decreased significantly in recent years, the supply in some systems and countries is not enough to satisfy demand, and chiefly because in all probability the Latin American countries intend to step up their rate of growth in 1970s.

A more optimistic although quite feasible projection of Latin America's economic development gives—on the basis of the demand of the main consumers of electricity—a figure of some 370,000 million kWh. This assumes an annual increment of close to 6 per cent in the gross product and 8 per cent in manufacturing. For the industrial sector, it was assumed as an extremely rough estimate that an additional 4 per cent should be added to the natural growth rate of 8 per cent to allow for increased use of electrical equipment (new technologies), giving a total annual expansion in electricity consumption of 12 per cent, or a slightly more than threefold increase over ten years. This assumes that industrial consumption will amount to some 200,000 kWh by 1979.

Consumption for non-industrial purposes was calculated in a similar manner. The growth rate for income (around 6 per cent) was added to the rate for electrification which was taken as 2.6 per cent, the net rate achieved during the 1960s (7.1 per cent annual growth in electricity consumption less 4.5 per cent disposable income). This aggregate rate of 8.6 per cent per year would mean that consumption would expand by 2.3 times in ten years; non-industrial demand then totalling some 115,000 million kWh.

Adding together the two figures and dividing the result by 0.85 (assuming that losses at the end of the 1970s will have fallen from their present level of 17.8 per cent to 15 per cent) indicates that electricity generation will have to amount to some 370,000 million kWh by 1979. This gives a cumulative annual rate of 10.7 per cent, which can be considered an upper limit.

(b) *Programming of electric generation capacity in the 1970s*

The expected demand for electric power in a given year together with a probable utilization coefficient, can be used to calculate the electric generation capacity that will be required. It should of course be borne in mind that each network's generating capacity has to be enough not only to satisfy the over-all energy requirements throughout the year but to cope with maximum potential demand as well. Therefore, in networks that depend on hydroelectricity, critical periods in supply may be due either to lack of potential or to scarcity of the natural energy resource.

In countries that use only, or mostly, thermoelectric plants, only the potential is important.

As already indicated, Latin America possessed an installed generating capacity of 30.8 million kW at the end of 1967, 42 per cent of which was hydroelectric.

An intermediate hypothesis between the upper and lower limits referred to earlier would suppose an output of 330,000 million kWh by 1979 (which would mean cumulative annual growth rate of 9.5 per cent). This would require an installed capacity of 83 million kW by the end of 1979, with 4,000 hours of utilization. In other words, besides the 4 million kW that were to be put into operation during the period 1968-1969, a net addition of almost 49 million kW would have to be installed during the 1970s.

Apart from this net addition, it is estimated that some 3 million kW would have to be allowed for by way of replacement. This estimate is very tentative and is based on data containing a considerable number of unknown quantities which need not be discussed in detail here.

According to published plans the generating capacity of the new plants for which plans had been approved or were in an advanced stage of study in Latin America totalled around 28 million kW in mid-1968 (in a few cases the projects will not be completed before 1980). Table 65 gives a general idea of these plans.

The fact that there is more data available on projects for hydroelectric plants and that these have to be planned longer in advance explains

Table 65

LATIN AMERICA: GENERATING CAPACITY, ESTIMATED ON THE BASIS OF PUBLISHED PLANS WHICH HAVE BEEN APPROVED OR ARE AT AN ADVANCED STAGE OF STUDY

(June 1968)

Country	*Period*	*Total (millions of kW)*	*Hydroelectric power stations*	
			Millions of kW	*Percentage share*
Argentina	1968-1980	4.0	2.8	69.5
Brazil	1968-1976	8.9	8.5	96.3
Colombia	1968-1980	2.8	2.1	75.9
Chile	1968-1975	1.3	1.1	84.0
Mexico	1968-1971	1.9	1.0	55.0
Venezuela	1968-1976	2.3	2.0	86.6
Central America	1968-1974	0.9	0.6	64.0
Other Latin American countries	1968-1980	6.0	2.6	43.3
Latin America		*28.1*	*20.7*	*74.0*

SOURCE: ECLA, on the basis of data from various sources.

the large share of hydroelectric energy shown in the table. It is estimated that 55 to 60 per cent of the total capacity to be installed during this decade will be hydroelectric, which means that a larger share of total capacity will be hydroelectric.

Some 10 million additional kW are now being added to existing capacity in Latin America.

For the period 1970-1980, nearly all the capacity to be installed is for the public supply services, since, in view of the various factors involved, it is unlikely that the present generating capacity of self-suppliers (7.3 million kW) will increase by more than 50 per cent during the decade under review.

When considering the expected increase in utilization (3,730 hours in 1967), due attention must be given to the load factor and to the reserve index of the generating plants.

While, on the one hand, there are reasons for increasing the load factor because the greater industrialization of the economies of the region, it is to be hoped that certain restrictions on supply during peak periods will be lifted, which would lead to its reduction. From an analysis of the existing situation in Latin American countries, there would on the whole appear to be little hope of any appreciable increase in the load factor of the region's electricity networks.

The reserve index is at present rather low, despite notable improvements over the past decade. At present there is a general trend towards raising this index slightly, since interconnexion improves the load factor and reduces the amount of reserve capacity needed, so that a steady supply can be maintained with a smaller reserve capacity.

Finally, the utilization coefficient of installed potential is understated in the figures given which include many units of production, particularly thermal units, which are virtually out of commission and are not used even during critical periods. There is therefore little ground for hope that there will be any major changes in the utilization coefficient.

According to the figures discussed here, there should be around 42 million kW of hydroelectric power and 41 million kW of thermoelectric power by the end of 1979.

In a normal hydrological year, utilization of capacity in hydroelectric power stations amounts to 4,700 hours, which is roughly the same as for the 1960s. Under these conditions, hydroelectric generation would reach 200,000 million kWh annually, leaving the thermoelectric sector to provide the remaining 130,000 million kWh with a similar utilization factor to that of 1967. This being the case, fuel consumption would be around 36.5 million tons of petroleum equivalent.

Under very poor average hydrological conditions (2,500 hours of utilization of hydroelectric capacity), 5,500 hours of thermoelectricity would be required. This is quite feasible, but 62 million tons of petroleum equivalent would be required to generate 225,000 million kWh and this would have an adverse effect on the balance of payments.[9]

The foregoing analysis stresses the supply of electric energy, but power may be less than adequate if there is a sharp drop in the water supply of a supply system which is largely hydroelectric and has little means of regulating the flow. Problems could arise also in networks with thermal generating plants in a doubtful state of repair. Certain countries would therefore be wise to conduct a short-term review of their electricity expansion programmes.

(c) *Cost of expanding electric supply systems*

As has already been shown, 49 million kW of additional capacity should be installed and 3 million kW of existing capacity should be replaced to meet foreseeable demand in the 1970s.

Some of the Latin American expansion programmes show sharp differences in unit costs, as might be expected from the widely differing situation in each country as regards size of plants, availability and characteristics of hydroelectric resources, their location, degree of integration of the systems, etc. The range of difference in unit costs is much greater for hydroelectric than for thermoelectric plants, being from 200 to 500 dollars per kW of installed capacity for the former and only from 130 and 250 dollars for the latter.[10]

Not only are the differences in unit cost much smaller in the case of thermoelectric plants, they are moreover to a large extent attributable to economies of scale.[11]

The unit costs of distribution networks also vary according to design (underground, open-air, concentration of consumption, new network or expansion of an existing network) and are between 250 and 350 dollars per kW as a rule.

Taking these facts and the considerable differences between countries into account, the over-all average for the whole of Latin America can be estimated at 450 dollars per kW of new capacity, including transmission lines and distribution networks.

As for the replacement of existing capacity, which affects virtually all thermoelectric plants and involves increasing the size of the plants, the average unit cost will be around 200 dollars per kW.

Total investment needs for increasing generating capacity, expanding and modernizing the existing networks and constructing new transmission lines in the 1970s therefore amount to around 22,000 million dollars. Since much of the work on electrical expansion, particularly the construction of new power stations, takes several years, a considerable portion of the expenditure on plants due to go into operation during the 1970s will have been made during the 1960s. Similarly, many of the plants which will start operating in the following decade will have to be financed in the 1970s. However, since expenditure in the 1980s will be higher than in the 1970s owing to the steady increase in demand, the figures given should be taken only as probable forecasts.

Table 66 gives some idea of the net capacity to be installed in Latin America and of total investment for 1970-1979.

Table 66

LATIN AMERICA: ESTIMATED INVESTMENT IN ELECTRICAL PLANT AND EQUIPMENT, 1970-1979[a]

Country	*Potential added (millions of kW)*	*Total investment (millions of dollars)*
Brazil	12.5	5,600
Mexico	10.5	4,500
Argentina	8.0	3,600
Chile	1.7	800
Venezuela	3.7	1,700
Colombia	3.6	1,650
Cuba	1.2	500
Peru	2.9	1,300
Uruguay	0.6	300
Central America	2.0	1,000
Other Latin American countries	2.3	1,050
TOTAL	*49.0*	*22,000*

SOURCE: ECLA estimates.

[a] To these figures must be added the figure for renewals of obsolete plant and equipment for the entire decade, which is estimated at 3 million kW and 600 million dollars. Real investment for the decade will be somewhat higher than the estimate, since it will include expenditure on buildings and plant which will not go into operation until the 1980s.

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[9] These figures are another demonstration of the close link between the different types of energy.

[10] In Brazil, for example, there are some very low-cost projects, such as the CEMIG plant at Jaguará, where the unit cost, including the entire transmission system, is estimated at 225 dollars per kW. The cost of the plant alone is 160 dollars per kW. The unit costs are probably much the same for the power stations at Estreito, Jupia, Furnas, Ilha Solteira, etc.

[11] In the United Kingdom the following average unit costs per kW of installed thermoelectric capacity were registered: for 30 mW plants, 170 dollars; for 60 mW plants, 145 dollars; for 120 mW plants, 140 dollars; for 200 mW plants, 125 dollars; for 350 mW plants, 100 dollars. (See "Modern Power Station Practice") (Central Electricity Generating Board of Great Britain, 1963.)

To judge by past experience, of the 22,000 million dollars' investment in electricity supply required for the whole of Latin America during the 1970s, about 40 per cent will be in foreign currency, ranging from approximately one third in countries that are in a better position to supply their own materials and electrical equipment, to two thirds or more in the relatively less developed countries. As the region's production of electrical and mechanical equipment is likely to increase appreciably, the volume of imports should fall.

It may therefore be of some interest to cast a glance at the possibilities of growth of investment in the electrical industry, bearing in mind the rapid growth of the gross domestic product and the domestic saving capacity.

The degree of electrification of the economy (on the basis of the number of kW generated for each dollar of the gross domestic product) increases in direct ratio to the growth of the product; that is to say, the consumption of electricity increases faster than the product—it rose 45 per cent for each dollar of production in Latin America during the period 1957-1967. This means that, as the economy develops, an increasing proportion of total investment will have to be devoted to the electricity sector.

It is estimated that during the 1970s investment in electric power generation and distribution will be somewhere between 7 and 9 per cent of total investment.

Much of this investment will come from profits on the sale of electricity, which depend on the rates charged (profit per kWh sold); the volume of electric energy actually consumed and paid for during the period 1970-1979 should amount to around 2.0×10^{12} kWh, in which case each thousandth of a dollar of profit per kWh sold should produce 2,000 million dollars. It is easy to calculate the level of projects that must be reached in order to permit the financing from domestic resources of different proportions of the total investment required.

(d) *The financing of expansion and its effect on the balance of payments*[12]

Two items in electricity generation have a bearing on the balance of payments: first, imports of equipment and machinery for generating, transmitting and distributing plants and secondly, imports of fuels (or, in the case of fuel producing countries, the reduction of fuel exports).

According to the estimates given above, one 9,000 million of the estimated 22,000 million dollars' worth of gross investment for the entire decade will be spent on imports, i.e., about 900 million dollars per year.

It is of some interest to compare this figure with the region's current import capacity (value of exports less the net balance of the services account, plus net external financing), which in 1967 stood at 9,300 million dollars.

Whereas every increase in the product is accompanied by a more than proportional expansion of generating capacity, import capacity tends to increase more slowly than the product. This means that the greater Latin America's economic growth rate over the next few years, the greater will be the effect of electricity development on the region's balance of payments, unless this effect is offset by import substitution in the field of electrical materials.

Turning now to the question of fuels and assuming an average unit value of 13 dollars per ton for petroleum, the outflow (or reduction of inflow) under this head in Latin America's balance of payments would climb from 230 million dollars in 1970 to around 470 million in 1979, totalling some 3,500 million dollars for the decade as a whole.

If the cost of fuel consumption is added to that of equipment in terms of foreign exchange, the estimated figure for the decade is between 8 and 9 per cent of import capacity.

Naturally, this over-all analysis is valid only for an ideal average situation for the whole of Latin America. In point of fact, the situation in each country may differ appreciably from this average for many reasons which include industrial capacity, the volume of domestic fuel production, foreign capital investment, loans in foreign currency, etc.

As to the financing of this foreign exchange component, it should be borne in mind that, between 1958 and 1967, the IBRD, IDB and the Export-Import Bank in conjunction with other United States Government agencies granted about 1,900 million dollars in foreign loans for Latin American electrical development projects.

As the estimated requirements in foreign currency for electrical expansion in the 1970s amount to 9,000 million dollars, it is obvious that, unless these agencies substantially increase their loans to Latin American countries for this purpose, the countries will have to seek new sources of financing in foreign currency. Between 1958 and 1967 electrical development loans to the region from these agencies amounted to 18.5 per cent of their total loans to Latin America, and to 59 per cent in the case of IBRD.

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[12] This analysis would have been more worth while if both petroleum and electric power could have been considered, but this was not possible owing to lack of information on petroleum.

All in all, the above institutions financed around two thirds of the imports of the electrical sector during the period 1958-1967. If the same proportion is to be financed by them in the 1970s, the annual average inflow of loans should be about 600 million dollars.

The remaining portion will probably have to be financed mainly out of the countries' current foreign exchange income, since the inflow of foreign private capital will probably be smaller than at present owing to the steady decline in the proportion of investment in Latin America's installed capacity coming from this source as a result of the nationalization of some companies and the increasing development of government enterprise.

The contribution to be made by private foreign investors will depend to a large extent on what happens to foreign enterprises over the next few years, though it is unlikely that the proportion of foreign exchange from this source will be larger than the present 15 to 17 per cent. This means that some 150 million dollars' worth of the region's imports of electrical capital goods would be financed by foreign private capital, much of it probably in the form of international loans.

Although suppliers' credit for the purchase of equipment and materials may at times be of real assistance, this is not really a solution because, as these credits are usually medium-term, they are not really appropriate for the electric power industry, which needs very long repayment periods.

3. *Prospects for non-traditional sources of energy*

A brief summary follows of the prospects offered by non-traditional sources of energy in Latin America for the 1970s.

(a) *Nuclear energy*

The most important non-traditional source of energy which may soon be playing a decisive role in the electrical industry is, without a doubt, nuclear fission. If it was consumed in its entirety, a single kilogram of fissionable material could produce as much energy as 1.8 to 2.1 million kg of petroleum. Even with current techniques, which waste all but one hundredth of the potential energy, fuel transport costs are reduced to virtually nothing, despite the elaborate precautions involved in handling nuclear material. Hence, unlike hydroelectric power stations, which can only be built in certain places, nuclear plants can be located close to the centres of consumption. The commercial viability of atomic power stations is an established fact, and it is expected that the United States, whose nuclear capacity in 1964 was around one million kW (less than 0.5 per cent of its total electric energy capacity) will produce about 170 million kW of nuclear energy by 1980 (approximately 30 per cent of planned additional electrical capacity). The United Kingdom, which in 1964 was producing less than 5 per cent of its electrical power by nuclear means, may increase the figure to 20 per cent in 1975.

In Latin America, nuclear power will be used for commercial purposes for the first time when the 320 mW Atucha plant in the Greater Buenos Aires network goes into operation in Argentina in 1971.

Experience has shown that certain conditions must be fulfilled before nuclear electric power can be produced at competitive prices. Above all, the power station must be on a large scale. The cost of installing 1 kW of capacity decreases faster in relation to the size for nuclear power stations than for conventional thermoelectric plants. The cost per kW in nuclear power stations equipped with reactors using enriched uranium drops by half as capacity is increased from 50 to 300 mW and by two thirds when it approaches 1,000 mW. In the case of reactors using natural uranium, the economy of scale is even greater. For large plants of 200 mW and more, the electrical networks must be at least five times larger if excessive reserve capacity is to be avoided.

Secondly, the cost of mineral fuels cannot but be relatively high. The National Commission set up to study the question in Argentina estimates that the cost of the electricity like that generated by the 320 mW nuclear plant at Atucha will be 6.8 mills per kWh, as against 7 mills per kWh in comparable conventional thermoelectric plants using fuel-oil at 1.6 dollars per million kilocalories (8 per cent annual interest). In the United States, it has been estimated that the very large nuclear power stations can compete with conventional plants even when the price of the mineral fuel is as low as 50 cents per million kilocalories.

Thirdly, as nuclear power stations need greater investment than conventional thermoelectric plants, they will have to operate at about 80 per cent of capacity in order to cut down the fixed cost per unit of energy generated (kWh.).

Finally, the possibility of installing nuclear plants must be contemplated when hydroelectric resources are small or when the demand for energy is far greater than can be economically supplied from existing sources.

Very few of the Latin American networks meet these requirements. Apart from the Greater Buenos Aires network in Argentina, the electricity networks of Brazil's Central-South and Mexico's Federal District are the only ones where sufficiently large nuclear plants with a high load factor could be introduced. Brazil's large potential hydroelectric resources are now being harnessed; nuclear energy is being contemplated for the middle or end of the 1970s. Mexico has abundant reserves of petroleum, natural gas, coal and hydroelectric power, but since the Federal Electricity Commission is studying the possibility of installing 300 mW thermoelectric plants in the central area early in the 1970s, the feasibility of nuclear generation is also being looked into. As to the other countries of the region bearing in mind the expected demand, the available conventional energy resources and the level of industrial development, it may well prove inadvisable to install nuclear power stations during the 1970s unless some unforeseen technological advance should make it possible to build small or medium-sized atomic reactors far more cheaply that at present.

Another way of using nuclear energy might be to install dual-purpose plants for electricity generation and for water desalination. A plant of this kind is being contemplated for the north of Chile, the north-west and Lake Texcoco area of Mexico, and in other arid regions. It is therefore of prime importance to establish how great the demand for energy will be and how competitive such dual-purpose nuclear plants would be in these areas.

Technological progress in this field may bring major changes, especially by producing enriched uranium more economically and using thorium, of which there are apparently abundant resources in the region (in Brazil, for example).

In view of the factors outlined above, it is possible that Latin America's installed nuclear capacity will be no more than 1.5 million kW by 1980, about 2.5 per cent of the region's planned additional capacity.

(b) *Geothermal energy*

The potential geothermical areas in Latin America have already been mentioned. There is a small 3.5 mW plant in the state of Hidalgo, Mexico; other possible sites in Mexico, El Salvador and Chile are currently being investigated. However, even if the outcome of this research proves positive it is still unlikely that geothermal power stations will be supplying the region with more than some 150 to 200 mW by 1980. Their electricity output, which may be very economical, would remain insignificant in comparison with the region's total production.

(c) *Oil shale*

According to a number of studies, the world's largest deposits of oil shale and asphaltic sand are far greater than known oil-fields. Consequently, such countries as Canada, the United States and the Soviet Union are conducting intensive research into ways of using these resources economically, and much progress has been made in this sphere in recent years.

In Latin America, Brazil owns major deposits of oil shale and research is going on into the technical and economic possibilities of exploiting them; Chile and Uruguay have some rather smaller deposits, while Argentina would seem to possess asphaltic sand. It is, however, unlikely that these energy resources will be an economic proposition for Latin American countries in the 1970s, except perhaps in the case of Brazil if costs can be sufficiently reduced.

(d) *Tidal, solar and other energy*

The tidal power station on the Rance estuary in France is the only one of its kind in the world. Electricity is generated by storing the water at high tide and releasing it through hydroturbines at low tide.

The decisive factors on which the economic feasibility of a tidal plant depends are the height of the tide, the area of the gulf or estuary enclosed, and the length of the dam. The higher the tide, the larger the area enclosed and the shorter the dam, the more suitable the location.

The difference between low and high tide at Rance is 11 to 13 metres. Similar conditions exist in the Isla de Maracá in Brazil (9.60

metres), the Colorado River in Mexico (12.30 metres), and in a few places in Argentina, such as Puerto Santa Cruz (12.5 metres), the Gulf of San José (8.70 metres), Puerto Gallegos (12.70 metres), Cabo Vírgenes (10.55 metres) and San Antonio (9.70 metres). Owing to their size, many of these would necessitate a considerable initial outlay. It is unlikely, however, that it will be possible to use tidal energy to help satisfy the region's demand for energy in 1970s. Nor is there much likelihood that energy produced by the sun, wind, etc., will become an economic proposition during the decade.

GUIDELINES FOR AN ENERGY DEVELOPMENT STRATEGY

Keeping in mind the main problems and objectives, it seems useful to review some strategy guidelines which have a recognized influence on the evolution of the energy sector, merely to facilitate the formulation of policies and definition of strategies by the competent officials in each country.

As noted in the preceding sections, the Latin American Governments are devoting special attention to this sector. The form and degree of government intervention varies from country to country and its orientation depends basically on the political and social trends prevailing in each. These trends, determine the nature of the countries' main economic and social interests, which are, therefore, reflected in the measures adopted in connexion with energy.

There is sometimes a marked incompatibility, however, between what a country considers the best over-all economic policy and the energy policy it actually adopts. Clear examples of this are the wasteful use of electric power for heating purposes, the lack of co-ordination between the prices of interchangeable forms of energy, the inadequacy of resources, mainly because prices and rates are fixed at a level which makes it impossible to finance the sector's expansion in line with over-all development needs, etc. Moreover, the use made of the key elements available is not in harmony with declared energy policy.

This lack of co-ordination is partly due to the fact that so little is known not only about the essential characteristics of this sector but also about each country's energy economy in terms of the nature of the resources available, the volume of reserves, ways of using them and the costs involved, normal productivity on the basis of available techniques, etc.

The decisions to nationalize electricity or petroleum enterprises, to incorporate them in State monopoly bodies, to leave such activities to private enterprise, or to permit the existence of both State and private enterprises, etc., have been tackled by the various governments in different ways. In some cases, certain sources of financing for the expansion of the sector (petroleum, electricity, coal, etc.) have been closed off, but no other sources have been opened up to ensure that the transfer of responsibilities does not lead to a drop in supply.

It must be stressed here that in spite of the heterogeneous nature of the energy sector inasmuch as it includes such diverse industries as electricity, petroleum, gas, coal, etc., there is a close economic interrelationship between its components. And yet, practically nothing that the Latin American countries have done indicates any awareness of this interrelationship, a fact which should lead to an effective co-ordination of the supply of energy resources and their economic use.

It is urgently necessary to gather information on the basis of which to determine the structure of local energy production and consumption, and the cost to the consumer.

It is not always easy to maintain a perfectly co-ordinated energy policy, even if the essential data are to hand. For such co-ordination to be possible there must be a central body which establishes guidelines for the over-all development of energy. This does not necessarily mean that the implementation (design and execution) of the energy plans is completely centralized, but rather that the authorities and public or private enterprises responsible for each section of the plan should bring their activities into line with the programmes devised by the central government. These programmes would help to establish permanent guidelines and procedures for the proper development of energy. It should be borne in mind that, as fuller information becomes available, both the policies and the plan would have to be reformulated, and they should allow the decisions to be implemented with sufficient flexibility.

A key problem in the implementation of energy development programmes is, at any given moment, to determine the best possible structure for the supply of energy in general and the level of supply for each form of energy in particular. Inevitably, during the implementation of the programmes there will be shortages and surpluses of capacity, which should be reduced to a minimum. In spite of having some of the technical and economic means to do so, Latin America has made little effort in this direction.

Surplus capacity for the supply of energy (over and above a prudent reserve in order to keep slightly ahead of demand) does nothing to accelerate economic and social development. Although energy is essential for development, a plentiful supply is not enough without the operation of many other factors. The energy industry is highly capital-intensive, so that even comparatively small surplus capacities absorb sizable financial resources, which remain inactive even though they are indispensable for other production factors. Implicitly or explicitly, this idea has been accepted in many Latin American countries, and surplus capacity has seldom been known at the national level. On the other hand, there has frequently been surplus capacity for the production of certain forms of energy in specific regions of a country

The widespread use of independent self-supply units as a reserve source of supply in case of power failures in the public supply systems is an expensive and inefficient duplication of capacity, which should be corrected by promptly expanding and improving the efficiency of the public supply.

The key elements available for mashalling and harmoniously integrating the various factors which enter into the framing of an energy policy are analysed below.

(a) *Development of domestic sources of energy and recourse to imports*

Although the world hydrocarbons market is favourable to importers, it must not be forgotten that most of the Latin American countries are experiencing balance-of-payments difficulties, which largely justifies the use, even at relatively high cost, of domestic commercial fuels, and the local refining of imported fuels.

Latin America is likely to continue consuming large quantities—measured in calorific power—of non-commercial fuels (wood, charcoal, industrial waste, etc.) for some considerable time. It would therefore be well advised not to go on neglecting the development and conservation of those sources of energy, as it has done hitherto.

There are energy importing countries which are far from having explored all their own reserves. Others have undeveloped resources and poorly supplied markets because they fear to change a situation which for years has remained static for no real political or economic reason.

Before any decision is taken to postpone the development of energy resources, particularly hydroelectric power, the proper course would be to evaluate the direct benefits that would be lost because of inadequate supply, the indirect benefits the country would have to forgo because of failure to establish this resource, and the unfairness of depriving the present generation of a resource to which future generations will have access.

(b) *Promotion of basic research and rationalization of the use of energy*

Obviously, if the measures described above are to be properly implemented, more knowledge is required about the energy resources in each country and the most suitable techniques for developing them. Unfortunately, this question has been sadly neglected, and prestige projects and quick returns have only too often been the order of the day.

This attitude may sometimes be explained by the fact that it is not easy to convince the non-specialists that investment is required for basic studies and the time needed to carry them out is justified; nor is it always politically expedient to publicize or adopt some of the measures suggested by such research. There is a fairly widespread trend towards channelling all efforts and resources towards the rapid execution of projects, even if they are not the most advantageous to the over-all economy, in order to demonstrate to the community that their aspirations are being satisfied.

In practically all the Latin American countries there are permanent agencies responsible for this type of basic research, but they do not always have the financial resources to take effective action. Some projects have been executed without taking into account the basic studies that had already been carried out, which has obviously been detrimental to the economies concerned. If steps were taken to correct such mistakes, they would certainly contribute to the economic development of the sector and of the country concerned.

Rationalization of the use of energy is understood here to mean not only the most economic use of each form of energy but also the co-ordination of policies governing domestic production and imports of energy resources.

If each form of energy is to be used in the most economic way, more detailed information must be obtained about the structure of the consumption of energy by type of consumer in the Latin American countries. In the meantime, however, steps could be taken to prevent the sheer waste of energy, such as the use of thermoelectric power for heating purposes. Without too much research, the authorities in each country could no doubt discover many cases in which energy is being squandered.

(c) *Establishment of prices and tax policy for the various forms of energy*

Nearly all the problems affecting the energy sector may be said to converge in the price and rate policy. It is important to note the relation between prices and both the financing of the sector and the structure of consumption. In principle, it may be maintained that in a sound economy prices are based essentially on costs and allow for returns on capital and rates of amortization which enable public or private energy producing enterprises to be adequately self-financing. The prices policy should be such as to attract new local and foreign capital and long-term loans to serve as permanent capital (as happens in the more developed countries, in the form of debentures, bonds, preferred shares, etc.), which would not be incompatible with the trend towards the State-ownership of energy resources observable in most countries of the region. The difficulty would be to find a way to maintain the value of such shares in the face of inflationary pressures, through the introduction of legislation ensuring prompt and adequate adjustments.

If the public authorities consider that certain categories of consumers should be granted subsidies in order to obtain energy at a price below its real cost, which would mean a reduction in the rates, the State would have to transfer to the producing enterprises the funds necessary to prevent a loss of investment. This procedure should be studied in advance in order to determine the best method to finance it. On the whole, the public should be kept duly informed about subsidies of this kind as well as taxes.

The availability of foreign capital through public or private loans will depend largely on how lasting are the measures adopted to solve the above difficulties. The financing of public services by means of direct private investment involves political and institutional as well as economic problems, which can sometimes be quite serious in the field of energy and of public utilities in general. The amount of foreign capital which can be channelled into other economic activities depends, *inter alia*, upon the development of the infrastructural sectors, particularly that of energy supply.

The structure of final consumption of the different forms of energy is dictated by their price, and changes in rates are quickly followed by a shift in consumption. This happens above all in developing countries, where energy consuming equipment is installed on a proportionally intensive scale and is selected on the basis of future rates. If prices are not fixed on a proper basis, distortions will occur in consumption which cannot easily be corrected later.

Stress has been laid in different parts of this study on the advisability of establishing over-all energy policies. It has been suggested that consumption patterns which will satisfy demand at a minimum social cost should be laid down within the context of a national programme for interchanging the different forms of energy.

The prices should be so established that the different forms of energy will be used according to the pattern envisaged. To deal separately with the prices of each form of energy, as is usually done, leads to decisions which result in irrational consumption patterns, with serious consequences for the national economies.

Taxes have also helped to distort prices, since they have been established without regard for over-all energy policy. Energy prices have frequently served, implicitly or explicitly, as a means of subsidizing other activities, without due consideration being given to the effects of this policy on the sector itself. This policy, combined with the fact that the basis for calculating prices is almost never correct, has made inroads on the sector's earnings.

(d) *Choice, order of priority and interrelationship of projects*

No attempt is being made here to suggest the best methods of selecting projects, determining their interrelationships or establishing orders of priority, since this is a very specialized field. Attention is, however, being drawn to the tremendous importance of these questions not only in deciding whether the over-all programme targets as regards the domestic supply and cost of energy will be achieved, but also for reducing as far as possible the inevitable over-all or regional surpluses or shortages of energy during the implementation of the programme. To ensure the continuity of the projects undertaken, it is essential to draw up a careful plan of the financial resources in both local and foreign currency which will be required to finance the projects.

Two mistakes which are very common in the region should be avoided, i.e., failure to give due consideration in over-all programmes to the relation of each project to the whole group, not only of new projects but also of existing facilities; and the application of highly sophisticated methods in selecting projects, without properly considering the limitations indicated by the relevant figures, which has often resulted in choices which appear to be objective but are in fact arbitrary.

(e) *Possible integration by means of multinational energy projects*

This is an important subject, from the standpoint not only of the joint development of energy resources with considerable economies of scale, but also of complementarity trade, which could include equipment used in energy industries. Integration can be achieved both through multipurpose water resources projects which include hydroelectric plants, and through the exploration of sedimentary river basins and the development of oil shale deposits, whether or not they are to be found in border areas. Similarly, regional co-ordination of hydrocarbon industrialization projects would enable more economic national systems to be established through intensive reciprocal trade.

It is too early to judge whether policies of this kind would be feasible over the short term. The prospects, however, are encouraging, and the possibilities should be followed up in the over-all context of Latin American economic complementarity, through the appropriate bodies.

MOBILIZATION OF DOMESTIC RESOURCES[1]

I. AVAILABILITY AND USE OF REAL RESOURCES: THE PROBLEM OF INVESTMENT

There is no need to stress the significance of the resources that are set aside for maintaining, expanding and modernizing production. Though the relationship between this factor and the growth and content of economic development is not so direct nor so immediately apparent as is sometimes suggested, there are few who would dispute its tremendous importance, particularly for economies that need to accumulate capital in order to provide a basis for overcoming what has been called the "vicious circle of poverty".

The purpose of this section is, first of all, to recall briefly recent experience in Latin America and in certain representative countries in terms of their efforts to promote investment and see how these efforts have affected the economic growth rate. An effort will also be made to analyse the main, real or material factors which condition internal possibilities of increasing productivity. The contribution of the external sector and balance-of-payments problems will not be discussed, except in so far as they are of incidental relevance.

1. *Capital formation in Latin America and certain groups of countries*

A long-term view of investment in Latin America as a whole reveals a relatively constant pattern. Between 1945 and 1960, for example, aggregate gross investment grew at a rate of 4.7 per cent per annum and maintained an almost constant ratio with regard to the gross domestic product (16 to 17 per cent), while annual fixed capital investment (construction, equipment and machinery) rose by barely 5 per cent.[2] There was little change between 1961 and 1967, except for the fact that, compared with the first few years of the decade, there was a slight dropping off towards the end. During the three-year period 1965-1967, gross investment stood at about 17 per cent of the gross product and fixed investment at around 16 per cent. By and large, assuming a fairly favourable capital-output ratio (0.40) and a thirty-year depreciation period, capital formation at this speed would indicate an annual per capita growth rate of less than 1 per cent.

Table 1 shows different investment coefficients and growth rates by country and brings out two significant points. First, there is a positive relationship between per capita income and the investment coefficient, at least to the extent that "the countries with the lowest per capita generally tended to have the lowest share of investment in total output".[3] Secondly, it shows that there are substantial differences between countries in similar situations, which would suggest that other factors come into play which make the investment coefficient higher or lower than would be expected from the income levels alone. In other words, there would appear to be a variable margin of capacity for the formation of producers' capital; it is therefore important to identify the factors which decide whether or not advantage is taken of this capacity for capital formation.

Another significant point is the relationship between the investment rate and the growth rate. Table 1 shows up the contrast in incremental capital-output ratios. In countries like Argentina, a high rate of capital formation goes hand in hand with relatively modest in-

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[1] A preliminary version of this paper was presented at the thirteenth session of ECLA, held in May 1969, under the symbol E/CN/12/827. It was one of a series of studies on the United Nations Second Development Decade.

[2] See ECLA, *Economic Development in the Post-War Period* (United Nations publication, Sales No.: 64.II.G.6).

[3] See *World Economic Survey*, 1959 (United Nations publication, Sales No.: 60.II.C.1), chapter 2, p. 65. This assumption is based on data from a larger number of countries than is dealt with here. The *Survey* points out that the relatively high investment rates to be found in certain developing economies nearly always occur in countries whose export trade is mostly in mining products (such as copper) or fuels (such as petroleum) and is controlled by foreign interests.

Table 1

INVESTMENT COEFFICIENTS AND GROWTH OF THE PRODUCT IN REPRESENTATIVE LATIN AMERICAN COUNTRIES, 1950 TO 1967

(Ratios based on annual averages in national currency and at 1960 prices)

	1950-1959			*1960-1967*		
	Annual rate of growth of gross domestic product	*Gross fixed capital formation as a percentage of gross domestic product*	*Incremental capital-output ratio*	*Annual rate of growth of gross domestic product*	*Gross fixed capital formation as a percentage of gross domestic product*	*Incremental capital-output ratio*
Group I						
Argentina	2.7	17.2	6.4	2.1	19.6	9.3
Brazil	5.0	16.1	3.2	3.5	14.1	4.0
Mexico	5.3	14.4	2.7	5.5	15.7	2.9
Group II						
Chile	2.9	14.3	4.9	4.3	16.4	3.8
Colombia	4.1	20.3	5.0	3.9	16.9	4.3
Peru	3.9	20.8	5.3	5.1	22.5	4.4
Group III						
Costa Rica[a]	5.6	17.5	3.1	5.7	17.7	3.1
Ecuador	4.3	11.4	2.7	4.1	12.5	3.0
El Salvador	...	...	...	5.4	13.8	2.6
Latin America	...	...	...	3.8	16.2	4.3

SOURCE: ECLA.

Methodology: See *World Economic Survey*, 1959 (United Nations publication, Sales No.: 60.II.C.I.), p. 73.

[a] 1953-1959.

creases in production. In others, such as Mexico and Brazil, the opposite has sometimes been true. And, in some countries, like Peru, there is a connexion between capital formation and the growth of the productive system.[4]

Despite these dissimilarities between such key variables, there are grounds for believing that, in the medium and long term, high and sustained rates of economic growth would hardly be possible without a similar trend in investment. On the other hand, it may also be maintained that although substantial capital formation is a necessary precondition for attaining satisfactory production growth rates, particularly in the short and medium term, by itself it is not enough.

It is therefore necessary to examine the factors affecting the relationship between rates of investment and of economic growth, and this has in fact been the subject of numerous analyses. One of the most important of these appeared in the United Nations *World Economic Survey,* 1959, which dealing essentially with the case of less developed countries, stressed three types of influencing factor.

The first type is related to the prevailing situation. At a given moment or over a given period, a country might be going through a phase of insufficient demand, in which case the mere fact of the situation changing would imply that a better return was being obtained on existing capital. Whereas in industrialized countries this is linked mainly with domestic expenditure in the peripheral countries it is far more likely to be linked to fluctuations and external demand, either directly—in cases where exports represent a substantial proportion of total demand—or indirectly—when imports are of strategic importance to the functioning of the economic system. It will be appreciated that, according to the specific situations and particularly in the short term, such circumstances are to a greater or lesser extent outside the sphere of national decision or control.

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[4] Similar and occasionally even more pronounced differences are to be found at the world level. For the trends during the 1950s, see *World Economic Survey*, 1959, op. cit.

Secondly, attention should be given to the existing investment structure or the volume of capital already formed. This may have a major bearing on economies that are engaged in some degree in the process of modifying their productive systems, as is the case in many Latin American countries that have switched from outward-directed growth to import saving industrialization. The most obvious and well-known form of this problem is this; there is a need for a relatively new infrastructure as a result of this switch, but the capital invested along the old lines in the export of primary commodities is not used so much—and sometimes not at all. Rapid urbanization and, even more, the concentration of population in urban areas, are other illustrations of the break between the existing form of infrastructure and the pattern required by the new trend in development.[5]

The United Nations World Survey drew particular attention to the experience of Argentina which it described in these words:

> "An extreme example of the effect of structural maladjustment on the relationship between aggregate investment and output is provided by the experience of Argentina. In a succession of years dating from the late nineteen-forties industry operated well below capacity levels partly because the absence of growth in the fuel, electrical power and transport sectors, when combined with acute balance-of-payments difficulties, created severe shortages throughout the economy.... At the same time, however, investment intended partly to overcome the sectoral bottlenecks depressing output in the economy as a whole continued to rise. As a consequence of this situation, the reported level of investment in relation to the growth in total output was extremely high during the greater part of the nineteen-fifties."[6]

In all these and other similar cases, the maladjustment between the existing structure of investment and the structure which is required under the new circumstances, whether justifiably or not is bound to entail the under-utilization of available resources or major additions to the capital stock if the maladjustment is to be corrected. This of course will tend to diminish at least temporarily the return on pre-existing investment.

Closely allied with this is the third point; namely, the composition of investment and its various capital-output ratios.

The return per unit of capital on investment in agriculture and industry, for instance, is usually considerably greater than on investment in installations and basic services—transport, communications, electricity, gas; the difference is even more marked with certain forms of social investment, in housing and urbanization, for example. This indicates that the over-all relationship between capital formation and the product is largely determined by the distribution of existing investment and of the resources to be allocated to the various sectors.

The above factors might lead to over-simplified conclusions about the possibility of achieving a rapid and significant increase in the return on capital by channelling nearly all investment towards those objectives or sectors where the incremental capital-output ratio is most favourable. On the one hand, the existing investment structure would impose obvious restrictions and limit the effectiveness of such a step to the marginal fraction of newly formed capital. On the other, account would have to be taken of the interdependence of the various objectives of the capital formation process. Nor are these the only considerations involved; for example, the economic and social criteria established by the over-all policy may carry more weight than mere short-term returns on investment. In other words, the possibility of influencing the components of capital formation depends on a number of factors.

From this point of view, Latin America does not possess satisfactory comparative data on the existing capital structure or, what is more serious on the composition of annual investment, especially in the private sector.[7] In the *World Economic Survey*, 1959, which covered developing countries in a number of different regions, a few preliminary conclusions were drawn, such as that the same proportion of investment was allocated to the industrial and basic services sector as in developed regions, whereas the amount invested in the agricultural sector seemed inadequate.[8]

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[5] A very common example of this is the way the long-established districts are often left behind by urban expansion, which takes place in outlying suburbs, despite the fact that the former already possess many infrastructural services while the latter have to build them from the ground up and at considerable cost.

[6] This is not the only explanation; other studies have pointed to quite different factors, such as the relatively high price of capital goods in Argentina and other countries.

[7] An exception to this rule is the research conducted by the Chilean Planning Office (ODEPLAN), whose findings were published in *La inversión geográfica bruta en capital fijo por sectores de destino, período 1962-1966* (Santiago, Chile, November 1967).

As these hypotheses do not refer strictly to Latin America and as they are based on data for the 1950s, they cannot really be applied to recent developments in the region. Nevertheless, with the help of incomplete and indirect information, it should be possible to suggest some of the general characteristics of capital formation in Latin America, though they will very likely reflect mostly what has happened in the relatively more developed countries of the region.

To start with, it is reasonable to assume that investment for purposes of urban, or metropolitan development has been rather more extensive than similar surveys of development and income levels have shown to be the case in developed economies. This has probably been so at every social level; that is to say that both the richer and, owing to social tension and pressure, the marginal suburbs have demanded a larger supply of real capital than during comparable periods in the economies of countries at the centre. This does not mean that either the absolute volumes of investment or the requirements of the two types of area are the same, since those of the former involve a far higher social and per capita cost. Whereas the rich suburbs ask for solid and spacious building equipped with every kind of corresponding high-investment convenience—heating, lifts, parks, telephones, etc.—the marginal elements ask no more than bare essentials such as water, lighting, public transport, etc.

These requirements resulting from urbanization have considerable bearing on the volume of investment in basic social services, whose poor capital-output ratio has already been mentioned. In other words, much of the investment under this head is required because of urbanization rather than being directly related to the productive system.

In examining the relationship between investment and the growth of the product consideration must be given to the higher absolute and relative cost of the new consumption patterns.

Capital formation in industry usually provides fairly favourable incremental capital-output ratios in the developing countries. This picture is largely based on situations that are more or less characteristic of the initial stages of inward-directed development in Latin America, i.e., situations where there is a significant margin of unused capacity in the traditional industries, and where these industries bear the brunt of effective demand that can no longer be satisfied by imports from aboard.

Both of these situations tend to change significantly in the course of development. The reserve capacity begins to dry up while there is a complete change in the composition of demand, towards heavier consumer durables, which begin to absorb an increasing proportion of over-all expenditure.

This phenomenon is affected not only by the growth and concentration of income, which widen and condition the market structure, but also by the demonstration effect, which in many cases switches from an external to an internal influence as the country's manufacturing industries begin to produce consumer goods that are more like those available in developed economies. The result is that, at the same time as this type of expenditure becomes more widespread, the social groups which indulge in this pattern of expenditure are increasing, which makes any attempt to regulate it more difficult. It used to be easy, for example, to restrict imports of secondary consumer goods when balance-of-payments difficulties arose; now, however, measures of this kind come up against such serious obstacles as the contribution of those industries to growth of the domestic product and the provision of employment opportunities, and the contribution made by the establishment and expansion of the new pattern of demand.

The manufacture of the new consumption goods requires large amounts of capital, highly specialized enterprises and a highly skilled labour force; in addition, these industries become increasingly dependent on foreign countries for their technological know-how, services and inputs, either because they are that type of industry or because they are usually in foreign hands.

If the new consumer habits are compared with the old, it will be seen that, in the past, the trend among the high-income groups was considerably less costly from the socio-economic angle and the point of view of opportunity costs, since demand was mainly for personal services, buildings, fine food products and luxury goods, which absorbed fairly substantial resources or resources that could not easily be used for other purposes. The situation varied somewhat, in so far as such consumption represented a demand for foreign currency, but for all that there can be no comparison with the new consumption patterns that are so widespread in communities with per capita incomes that are three or four times as high as those usually to be found in Latin America.

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[8] See *World Economic Survey*, 1959, op. cit., chapter 2, pp. 73 *et seq.*

These and other considerations regarding the composition of investment reveal the limitations of a strictly quantitative approach. Nonetheless, no attempt will be made in this study to lay down general rules for the criteria and objectives that should be adopted in allocating capital resources, an impossible task in any case. Such a task posits the existence of a specific economic and social development strategy, and can have meaning only in the context of a national programme.

2. *Real capacity for expansion*

The main factors on which potential investment or growth[9] depend are: the supply of imported capital goods; the production of basic intermediate goods; the output and installed capacity of the capital goods and consumer durables industry and the possibility of their being put to other uses; and the productive reserves, i.e., the various human and material resources that can be incorporated in the production process.[10]

Dependence on foreign countries for imports of machinery and equipment is characteristic of the stage of development reached by Latin America as a whole—a dependence which is due to the fact that the capital goods sector has only a very small place in the production structure. The availability of these goods therefore depends on the countries' ability to pay for them and their need for other imports. Thus, one of the keys to economic development and to the transformation of the productive systems continues to be tied to a factor which is outside the scope of national decisions, namely, the trend of demand for each country's exports and for exports from the region—the main determinant of their ability to pay for their imports.

These are very marked differences between countries in this respect which strongly reflect their relative levels of development. Table 2 shows, for various periods, the imports of capital goods of the same representative countries as a percentage of their gross fixed investment. During the period 1963-1965, they accounted for 14 per cent in Argentina and slightly over 20 per cent in Brazil and Mexico; at the other end of the scale come Costa Rica and El Salvador with 46 per cent, in between, Colombia with 27 per cent, and Chile and Peru with slightly over 30 per cent.

Since the middle of the 1950s, nearly all the countries have increased the amount of national resources devoted to fixed investment. The only exceptions are El Salvador and Ecuador in Group III, plus a very slight change in the case of Costa Rica, which goes to show that it is the smaller economies, or the countries that are relatively less developed economically, that face the greatest difficulties.

The progress made by many countries is largely due to the trend in only one of the components of fixed investment—construction—while progress has been much slower in the other, equipment and machinery. Taking Latin America as a whole, imports under this head have accounted for about 45 per cent of the total in recent years. For Argentina and Brazil, the figures are respectively 28 and 38 per cent, rising to 60 per cent for Colombia and 80 per cent for Chile and, presumably, even higher in countries with less diversified systems of production.[11]

Table 2

LATIN AMERICA: IMPORTS OF CAPITAL GOODS AS A PERCENTAGE OF GROSS FIXED INVESTMENTS[a]

	Around 1955	*1960-1962*	*1963-1965*
Group I			
Argentina	24.7	22.4	13.8
Brazil	31.2	29.9	22.7
Mexico	33.8	25.6	21.1[b]
Group II			
Chile	54.1	37.8	30.5
Colombia	33.2	31.6	26.9[c]
Peru	39.5	38.8	31.4
Group III			
Costa Rica	45.4	46.3	46.9
Ecuador	46.4	37.7	42.9
El Salvador	...	37.9	46.0

SOURCE: ECLA, on the basis of data from International Monetary Fund, *International Financial Statistics.*

[a] Including construction materials.

[b] 1963.

[c] 1963-1964.

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[9] See N. Kaldor and I. Sachs, *Obstáculos al desarrollo y planificación,* México (Editorial Nuestro Tiempo, 1962).

[10] This section will also cover the availability of a surplus of consumer goods, which has sometimes been considered in other studies as another component of the investment potential.

[11] These figures are taken from a study currently being prepared by ECLA on the manufacture of machinery and equipment for basic industries in certain Latin American countries.

3. *Evolution of imports of capital goods*

Imports of capital goods represent the most important factor in the relatively less developed countries where there is little diversification of industry; in other countries these imports are of key importance in obtaining even more complex and technologically up-to-date equipment and machinery. Table 3 shows average per capita imports of capital goods for three-year periods from 1950-1952 onwards.

Looking at the three countries where industry is most diversified, it will be noted that imports of capital goods followed a favourable trend in Mexico, where in the two most recent periods (1959-1961 and 1962-1964) they came close to Brazil's in absolute terms, and exceeded them in relation to the population. Brazil's imports reached fairly high levels up to 1959-1961, but declined in the next few years to very low absolute and relative levels (considering its population) in 1965, the latest year for which comparable data were available.[12]

In Argentina, on the other hand, capital goods imports were more or less stationary up to 1956-1958—though with a larger per capita supply than the other two countries—but moved to much higher levels in the two following three-year periods up to 1965, when there was a sharp decline.[13]

On the whole, the trends of the three most important and most diversified economies do not seem to be too unfavourable, particularly

Table 3

LATIN AMERICA: AVERAGE PER CAPITA IMPORTS OF CAPITAL GOODS FOR THREE-YEAR PERIODS, BY GROUPS OF COUNTRIES, 1950-1952 TO 1965

(C.i.f. values, averages in millions of dollars at current prices, and per capita values in dollars at current prices)

Groups of countries		*1950-1952*	*1953-1955*	*1956-1958*	*1959-1961*	*1962-1964*	*1965*
Group I							
Argentina	Average	293.90	237.60	295.00	450.50	501.80	309.10[a]
	Per capita	16.82	12.81	15.04	21.80	23.14	13.83
Brazil	Average	684.90	508.10	488.10	575.10	483.40	317.10[a]
	Per capita	12.79	8.69	7.64	8.25	6.35	3.93
Mexico	Average	269.60	312.00	458.60	464.60	478.40[b]	...
	Per capita	9.96	10.53	14.06	12.89	12.20	...
Group II							
Chile	Average	100.00	112.10	177.10	209.70	233.70	231.00[a]
	Per capita	16.18	16.92	24.81	27.32	28.46	26.91
Colombia	Average	163.00	289.60	226.30	215.10	237.20	...
	Per capita	14.01	22.71	16.15	13.97	14.01	...
Peru	Average	98.90	120.00	190.90	161.20	244.50	244.20[a]
	Per capita	12.18	13.95	20.66	16.07	22.30	20.96
Group III							
Costa Rica	Average	...	24.40	30.10	32.70	37.80	...
	Per capita	...	24.65	27.09	26.14	27.17	...
Ecuador	Average	24.80	42.60	42.20	44.90	47.40	...
	Per capita	7.45	11.69	10.59	10.30	9.84	...
El Salvador	Average	...	20.20	28.40	25.00	38.10	...
	Per capita	...	9.73	12.58	10.18	13.99	...

SOURCE: ECLA, *Statistical Bulletin for Latin America*, vol. V, No. 1.

[a] 1965.
[b] 1962-1963.

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[12] Other information shows that these imports took a sharp upturn in 1966-1967. See *Economic Survey of Latin America*, 1966 (United Nations publication, Sales No.: E.68.II.G.1), part Two, chapter III, and *Economic Survey of Latin America*, 1967 (United Nations publication, Sales No.: E.69.II.G.1), part Two, chapter I.

[13] There does not appear to have been any marked change in 1964-1967. See *Economic Survey of Latin America*, 1966 and 1967, op. cit.

since investment possibilities improved as a result of the establishment of basic and capital goods activities during this period.

The recession over the last few years in Argentina and Brazil may be ascribed to several factors and not merely to their limited payment capacity. It must be remembered, of course, that the stabilization policies which these countries adopted at different times in the 1960s had quite unintended restrictive effects on the industrial sector, which plays a key role in demand for imported equipment and materials.[14]

Moreover, the major private activities were more concerned during this period with financing their normal production and utilizing their installed capacity to the full than with investing in expansion of plant or in new production lines. In these circumstances, public investment has taken on more significance,[15] but construction usually absorbs a larger share of public than of private investment; thus the import content of public investment is generally smaller.

This situation could also be associated with changes in the structure of imports, i.e., an increase in the share of inputs at the expense of capital goods. In Argentina, for example, imports of new materials and intermediate products rose appreciably from 1960 to 1965, while imports of capital goods declined.[16]

The economies of Colombia, Chile and Peru followed essentially different trends (see table 3). Chile and Peru show substantial increases in both absolute and relative figures between the beginning of the 1950s and the latter years. This trend no doubt bears some relation to the fairly satisfactory growth rates of these two countries during the 1960s (about 5 per cent annually from 1960 to 1967 in Chile, and over 6 per cent in Peru). Nevertheless, Chile's economic growth in particular does not seem to have been so rapid as might have been assumed from the evolution of its imports, at least up to 1965, and it was considerably more irregular.[17]

The appreciable increase in Colombia's purchases of capital goods compared with the early 1950s subsequently levelled off and the advantageous situation in the middle of the decade was not regained.

The less diversified economies, in which imports of capital goods are essential for the investment process, also showed favourable trends. There were increases in both Costa Rica and El Salvador; Ecuador's imports remained at about the same absolute levels, although the per capita figures were somewhat lower than in other countries.

The question is whether, once the effect of internal circumstances has been overcome, this favourable trend can be maintained over the medium or the long term, given the balance-of-payments prospects, and if so, on what factors the possibilities of increasing the share of imported capital goods in investment would depend.[18]

The first measure would be to change the structure of imports so as to increase the share of capital goods without raising the total. This has always been a major aim of Latin American economic policy; in fact, the inward-directed development process meant a general reduction in the proportion allotted to purchases of consumer goods and a corresponding increase in that of inputs and capital goods.

Some data on the evolution of the composition of imports over a fairly long period (1950-1965) are set out in table 4.

In the first place, the share of consumer goods clearly hinges on the degree of diversification of the production system; there seems to be little chance of reducing this expenditure, in either absolute or relative terms, in the more developed countries, but more chance of doing so in the Central American countries, for example, where these imports still absorb approximately one-third of the total. Of the countries at an intermediate stage of development,

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[14] Industrial production remained virtually at a standstill in Argentina during the period 1965-1967 (see *Economic Survey of Latin America*, 1967, op. cit., p. 123, and grew by an average of only 1.8 per cent (with violent fluctuations) in Brazil from 1962 to 1964 (*ibid.*, p. 102).

[15] The share of public investment in total fixed investment increased in Argentina, and more so in Brazil. Between 1960-1962 and 1964-1966 it rose from 22.4 to 28.5 per cent in Argentina, and from 68.1 to 83.5 per cent in Brazil (*ibid.*, p. 101).

[16] See *Economic Survey of Latin America*, 1965 (United Nations publication, Sales No.: 67.II.G.1), p. 129.

[17] Chile regained and even stepped up the rate of growth of its imports in 1966 and 1967, although the latter year marked a sharp decline in the economic growth rate (2.8 per cent). See *Economic Survey of Latin America*, 1967, op. cit., p. 153.

[18] See, for example, Latin American Institute for Economic and Social Planning, *La brecha comercial y la integración latinoamericana* (México, Siglo XXI, 1967).

Table 4

LATIN AMERICA: STRUCTURE OF IMPORTS, 1950-1965

(Percentages)

	Year	*Consumer goods*	*Inputs*	*Capital goods*
Argentina	1950	13.1	44.0	21.8
	1960	9.6	35.8	34.9
	1965	9.5	52.0	22.8
Brazil	1950	15.3	33.7	34.0
	1960	5.6	35.5	38.3
	1965	7.7	46.0	23.5
Chile	1950	12.1	43.4	27.1
	1960	15.7	32.7	36.9
	1965	15.7	41.1	22.4
Colombia	1950	20.8	35.8	33.2
	1960	11.3	40.6	40.3
	1965	11.1	38.1	43.2
Peru	1950	27.3	30.2	33.6
	1960	22.7	32.1	35.6
	1965	24.1	30.1	35.9
Central America	1950	37.7	21.4	14.7
	1960	36.4	28.4	19.0
	1965	33.2	31.1	22.8

SOURCE: *Economic Survey of Latin America*, 1965 (United Nations publication, Sales No.: 67.II.G.1), table 38.

only Peru shows a somewhat higher proportion of this type of imports.[19]

No very clear trends emerge from a comparison of the proportions of inputs and capital goods, since the contraction in the share of capital goods in Argentina and Brazil in 1965 was undoubtedly brought about partly by internal restrictive factors. It may be assumed that the share of capital goods would tend to increase at the expense of inputs in the stages of expanding and transforming the structure of production, whereas, it would shrink where attempts were being made to utilize installed capacity or where the economic system was losing its momentum.

Although there may now be less chance than before of altering the proportions of the major import items, this by no means implies that the internal composition of these items cannot usefully be modified or that investment returns cannot be considerably improved through the choice of such goods.

Although the shortcomings of planning systems and criteria do much to limit the possibilities of a rigorous choice, it should not be forgotten that in most of the Latin American countries there is a considerable flexibility in regard to imports of production goods. First, this reduces or eliminates any incentive to replace imports by locally produced machinery or equipment and, secondly, it makes it impossible to concentrate imports in such a way as to incorporate technical advances in the sectors or activities where they are most needed. Here, as in other aspects of industrial development, an extensive rather than an intensive strategy has been adopted.

Recent experience in Chile provides a telling illustration of this point. Only 20 per cent of Chile's investment in equipment and machinery is in its own manufacturing industry. Moreover, in 1962-1966 (the only period for which complete data are available), imports of these goods rose by about 20 per cent, and domestic output by less than 7 per cent.[20] Although this disparity is partly attributable to favourable external sector conditions and it accounts for the increase is borrowing,[21] it has been made clear in a number of studies that the possibilities of expanding Chile's capital goods sector have not been sufficiently explored.[22]

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[19] It should be borne in mind that in some States, e.g., Peru itself and particularly Chile, imports of certain basic consumer goods such as foodstuffs were fairly considerable, and in Central America the integration process may have some effect.

[20] See *La inversión geográfica bruta en capital fijo por sectores de destino, período 1962-1966*, op. cit., tables 14-A and 15-A.

[21] See *Economic Survey of Latin America*, 1965, pp. 78 *et seq.*

Several factors account for the failure to do so, and they probably exist in other Latin American countries as well. A recent study[23] deals with those connected with the financing of domestic production and the instability of demand, which often go hand in hand. The importance of the fact that there has been so free and indiscriminate an import policy for capital goods should not be underestimated, however. As regards Chile, the same study emphasizes that customs exemptions, the abolition of foreign exchange requirements (such as prior deposits), the incentives to foreign investment and the privileges accorded for public and private purchases for investment in specfic regions or activities in practice all amount to almost complete freedom to import capital goods. It is worth stressing that the fiscal and customs reform carried out in Brazil in 1957 was perhaps the first to extend discrimination in imports to production goods. Together with other measures, it thus contributed significantly to the expansion and diversification of this industrial item.[24]

As stated in a recent article[25] on the attitude of private, and possibly also public investors to protectionism or discrimination with respect to imports in different stages of industrialization, there may at first be considerable support for import restrictions on final consumer goods while imports of production goods and inputs are encouraged or permitted. The attitude tends to change, however, when substitution also extends to these items. Added to cost and quality considerations is the fact that financing conditions are often more advantageous abroad. Thus, the opposition to broadening selection and protection criteria is strengthened, although such a broadening may be essential to harmonize if the growing demand for imports of inputs and capital goods is to be harmonized with payment capacity.

The reorientation of policy on this subject could stimulate the domestic production of capital goods (or basic inputs) and concentrate the capacity to import in those areas which make the most highly specialized technological contribution in the most strategic sectors. In both ways it could affect investment volume and returns.

The possibilities of reasonable discrimination and viable substitution in respect of capital goods must not, however, be exaggerated. Such possibilities will be more remote the lower the relative level of development and the smaller the market. Even in the best placed economies, potential substitution could entail a substantial rise in the cost of investment, establishing another unfavourable factor in the saving and capital formation process. In both cases, the regional and subregional groups of countries could overcome the drawbacks concerned and make the policy guidelines more viable.

Moreover, it must not be forgotten that the formulation of a capital goods import substitution policy is not aimed at complete self-sufficiency. It merely responds to the not too favourable prospects of expanding the capacity to import these and other goods and to the consequent need to concentrate the supply of foreign currency in top priority activities.

4. *Production of basic intermediate goods*

One of the most important internal factors governing the possibilities of capital formation is the production of certain basic intermediate goods, such as cement, steel and energy, which has been given preferential attention in all policy programmes for expanding production capacity.

As their name suggests, these and other intermediate products constitute links in the production chain, the main fact being that they are either consumed or used for different types of capital formation. Generated energy can be divided between consumption and industrial uses, cement between the building of housing units and offices and the construction of dams and roads, steel between production equipment and household appliances, etc.

Whatever the distribution of these products among a wide range of uses—about which no generally comparable data are available—there is no doubt that the first fact to be taken into account is their availability and recent evolution. A basic point here is the difference between countries at more advanced and less advanced stages of growth or diversification. In the less advanced countries a substantial proportion of these goods is imported, while as the economies become more industrialized a growing proportion is produced locally.

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[22] See, *inter alia,* Chilean Steel Institute, *Factibilidad de la producción nacional de equipos industriales de base,* Santiago, Chile, 1966.

[23] *Ibid.*

[24] See "Fifteen years of economic policy in Brazil", *Economic Bulletin for Latin America,* vol. IX, No. 2 (November 1964).

[25] See D. Hirschman, "The political economy of import substituting industrialization in Latin America", *The Quarterly Journal of Economics,* vol. 1 (February 1968).

Tables 5 and 6 show some data on the production of cement, steel and energy in selected countries during various three-year periods from 1956-1958 onwards. (It should be borne in mind that the figures may be affected by the state of demand, so that the existing production potential may be larger than the actual capacity utilized at certain stages.)

All the countries recorded sizable increases in cement production between the first and last periods considered. Output in Mexico, Peru and Ecuador almost doubled; in Colombia and Chile it rose by about 70 per cent; and in Argentina, Brazil and El Salvador it was 50 per cent higher or more. In all cases, the expansion of production outstripped population growth.

Steel production shows an even more dynamic trend, although it should be borne in mind that some countries, such as Argentina, Peru and Colombia, started from relatively low production levels. Moreover, the steel-producing countries include none of the countries in group III, which still rely entirely on imports.

Argentina and Peru—which were far behind the other countries in their respective groups in 1957-1958—recorded the fastest rates of growth: five times and three times the initial output in 1965-1967 (1968 for Peru). Next come Mexico and Colombia, which raised production 1.7 and 1.6 times respectively—although Colombia was also comparatively backward in 1956-1958. Lastly, of the States which

Table 5

LATIN AMERICA: AVERAGE CEMENT AND STEEL PRODUCTION FOR THREE-YEAR PERIODS, 1956-1958 TO 1965-1967

(Thousands of tons)

Groups of countries	*1956-1958*	*1959-1961*	*1962-1964*	*1965-1967*	*Percentage increase in production from 1956-1958 to 1965-1967*
			Cement		
Group I					
Argentina	2,273	2,611	2,757	3,417	50.3
Brazil	3,399	4,311	4,994	5,594	64.6
Mexico	2,465	2,944	3,793	4,936	100.2
Group II					
Chile	741	858	1,194	1,262	70.3
Colombia	1,215	1,434	1,818	2,063[a]	69.8
Peru	567	592	756	1,088	91.9
Group III					
Ecuador	156	192	254	351[a]	125.0
El Salvador	82	81	78	124	51.2
			Ingot steel		
Group I					
Argentina	223	311	935	1,320	491.9
Brazil	1,572	2,222	2,826	3,465	120.4
Mexico	998	1,495	2,020	2,747	175.3
Group II					
Chile	400	429	545	561	40.3
Colombia	91	169	203	239	162.6
Peru	20[b]	62	76	85	325.0

SOURCE: ECLA, *Statistical Bulletin for Latin America*, vol. V, No. 1 (United Nations publication, Sales No.: 68.II.G.8).

[a] 1965-1966.

[b] 1958.

Table 6

LATIN AMERICA: PRODUCTION OF ENERGY (HYDROELECTRICITY, CRUDE PETROLEUM AND NATURAL GAS), 1956-1958 TO 1965-1967

(Thousands of tons of petroleum equivalent)

Groups of countries	*1956-1958*	*1959-1961*	*1962-1964*	*1965-1967*	*Percentage increase in production from 1956-1958 to 1965-1967*
Group I					
Argentina	6,218	12,566	19,883	20,914	236.3
Brazil	7,377	10,456	11,457	14,369	94.8
Mexico	19,755	25,996	30,108	35,808	81.3
Group II					
Chile	2,344	3,881	7,058	8,578	266.0
Colombia	8,869	10,274	11,010	13,443	51,6
Peru	4,033	4,299	4,830	5,667	40.5
Group III					
Costa Rica[a]	98	122	137	170	73.5
Ecuador[b]	481	429	410	416	—13.5
El Salvador[a]	67	79	95	114	70.1

SOURCE: ECLA, on the basis of official statistics.

Note: In order to express hydroelectricity in terms of petroleum, 1 kWh was considered to be equal to the number of kilogramme-calories that would have been required to generate the same amount of thermoelectricity. This was considered to be 4,000 kcal in the period 1950-1959, 3,500 in 1960-1964, and 3,000 in 1965-1968. Hence the factors for converting GWh into thousands of tons of petroleum equivalent were 0.38, 0.39 and 0.28, respectively.

[a] Hydroelectric energy only.

[b] Excluding natural gas.

were in an advantageous position in the first three-year period—having established up-to-date steel plants in the previous decade—Brazil more than doubled its production and Chile raised its output by 40 per cent.[26]

There has also been a considerable increase in energy production (see table 6). A comparison between the figures for 1956-1958 and those for 1965-1967 show marked increases in the group I countries and also in Chile,[27] while Costa Rica and El Salvador showed a satisfactory rise of approximately 70 per cent. Only in Colombia and Peru was the trend unfavourable, but it may well have been affected by the formulas for conversion into petroleum (see note in table 6).

Despite the contrast and fluctuations brought about by circumstances, the general picture with regard to basic intermediate products is fairly favourable.[28] As regards the question under discussion, this trend implies that there may have been some changes in the proportions absorbed by consumption and capital formation without the former having had to be absolutely restricted. It is impossible to assess the magnitude of the possible changes in these proportions, but in any case it is essential to bear in mind that higher rates of investment and of per capita consumption in absolute terms may be perfectly compatible in a moderately dynamic economy.

5. *Production of the metal-transforming industries*

The stage of development, expansion prospects and composition of the product of the metal-transforming industries perhaps constitute the key factor in domestic investment potential. This sector includes the production of capital goods and the major durable consumer goods industries. The international classification and the available data preclude any clear distinction between these two production lines, partly because many industries can operate along both lines, which is one of the reasons why they are particularly relevant here.[29]

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[26] The programme for expanding Huachipato, in Chile, aims at raising its capacity to 700,000 tons. Brazil's steel plants are planning to raise production to some 6 million tons in 1972.

[27] It should be borne in mind that the increase recorded in Chile was offset by a decline of as much as 22 per cent in coal production between 1956-1958 and 1965-1967; in absolute terms it dropped from just over 2 million to 1,626,000 tons.

[28] It must not be forgotten that the per capita supply of these goods stood at relatively low levels. For example, total per capita consumption of energy for the whole of Latin America in 1966 was only about 500 kilogrammes, which represents one-quarter of that recorded in Western Europe, for instance, and is less than half the estimated figure for the world as a whole.

Latin America's production in this sector grew fairly rapidly in over-all terms. The annual growth rate from 1959 to 1964 was 8 per cent, while the total manufacturing product rose by only 5.5 per cent. The period of most rapid growth seems to have been the second half of the 1950s, when industries producing electrical machinery and equipment and motor vehicles were established in Brazil and Argentina.

Such progress has been heavily concentrated in certain countries, however, with Brazil, Argentina and Mexico accounting for an estimated 90 per cent of the region's total metal-transforming output.

The changes and proportions in selected groups of countries are shown in table 7, in which the absolute value of production in the three major countries in 1967 (slightly over 8,000 million dollars at 1966 prices), or in any one of them, may be compared with the values for the countries in group II; metal products (major group 35) are included in the figures for Colombia and Peru, but not in those for other countries, for want of data.

There are also distinct though less marked disparities in per capita production, except in the case of Argentina. But rapid increases were recorded in Brazil, Mexico, Colombia and Peru, and a somewhat slower growth in Chile and Argentina, particularly in the latter country between 1960 and 1966. Costa Rica is still at an incipient stage of development in these activities.

From the standpoint of disparities in diversification, two basic situations may be distinguished in the countries considered. The group I countries (Argentina, Brazil and Mexico) have already created a relatively independent internal expansion potential, at least in comparison with the economies which are heavily dependent on imports of capital goods and basic intermediate products. Probable demand for equipment and machinery for certain basic industries (pulp, paper, petroleum products, cement, steel products, generation and distribution of electrical energy, and rail and maritime transport) in 1967-1970, together with internal capacity to satisfy it, was estimated in a study. In Argentina and Brazil it was estimated that demand stood at 136 and 430 million dollars, respectively, of which 150 and 300 million dollars' worth could be satisfied locally in each case.

In these circumstances, the main problem lies in ensuring that this potential is fully utilized and that the existing capacity and resources are channelled as far as possible (by technical, economic, social or policy measures) into investment. The first criterion could be followed without adopting the second, and possibly this has been the prevailing trend in recent years, although the orthodox stabilization policies have sometimes been incompatible with both objectives.

The position is quite clear as regards industries specializing in the production of capital goods, but it is somewhat different where industries which produce or could produce, both capital and durable consumer goods are concerned.

Experience in the motor-vehicle industry is encouraging. Without going into its establishment and characteristics, the point is that it exists as an important new basis for the diversification of manufacturing. In view of the difficulties that are hampering its continued activity and growth, it is useful to recall the options set forth above. The first would entail maintaining or rather inflating demand by every conceivable device, regardless of any distortions or undesirable secondary effects deriving from such a decision. The second would mean so implementing the over-all goal that full utilization would have more beneficial repercussions on development through the growth of investment.

Specifically, the option could be considered to lie between the share of passenger cars and that of utility vehicles in total production (or, more hypothetically between the proportions for export and for domestic use). If the second option is chosen as part of the general aim, the intention would obviously be to increase the share of those types of motor vehicles which undoubtedly represent capital formation

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[29] A thorough examination of the outstanding features of these activities was made in the ECLA study "Los principales sectores de la industria latinoamericana: problemas y perspectivas" (E/CN.12/718/Rev.1), vol. II, table V-1. Many of the data included in the present study were taken from this source and relate to the following major or the original ISIC groups: (35) metal products; (36) machinery, except electrical machinery; (37) electrical machinery and equipment; and (38) transport equipment.

Table 7

LATIN AMERICA: PRODUCTION OF THE METAL-TRANSFORMING INDUSTRIES

Country and ISIC group	*Per capita production value (dollars at 1960 prices)* 1950	1960	1967	*Per capita value index 1950 = 100* 1967	*Total production value (millions of dollars at 1960 prices)* 1967
Group I					
Argentina (36 to 38)	55.26	153.80	158.52[a]	286.9[a]	3,629.8[a]
Brazil (36 to 38)	9.64[b]	30.01	40.15	416.5[c]	3,439.1
Mexico (36 and 38)	7.88	14.01	23.70	300.8	1,083.8
Group II					
Chile (36 to 38)	15.85[d]	18.43	19.61	123.7[e]	179.0
Colombia (35 to 38)	3.65	13.03	18.98	520.0	367.0[a]
Peru (35 to 38)	5.03	13.06	20.42	406.0	252.9
Group III					
Costa Rica (36 to 38)	—	4.21[f]	5.10	121.1[g]	8.2

SOURCE: ECLA, "The Process of industrialization in Latin America Statistical annex" (E/CN.12/716/Add.2), and *"Indices de volumen de la producción manufacturera"* (November 1968); and Latin American Demographic Centre (Centro Latinoamericano de Demografía — CELADE), *Boletín Demográfico.*

[a] 1966.

[b] 1955.

[c] 1955=100.

[d] 1953.

[e] 1953=100.

[f] 1963.

[g] 1963=100.

(lorries, buses, taxis, and even agricultural and other equipment that could come under the heading of the motor-vehicle industry).

The proportions in which motor-vehicle production is distributed vary markedly from country to country. Not counting the very special case of the socialist economies—in the Soviet Union, for example, utility vehicles accounted for 66 per cent of production in 1966—that same year it reached 62 per cent in Japan, compared with 21.5 per cent in the United Kingdom and 17 per cent in the United States. In Argentina and Brazil the proportions were 25.4 and 29.6 per cent respectively.[30]

In other words, without overlooking or underestimating the whole question of expansion or the establishment of new activities,[31] the main problems affecting the first group of countries seem to be in general on the side of demand, including of course its composition and financing.

The economically relatively less developed countries have somewhat different possibilities and problems. Generally speaking, the basis of essential intermediate goods industries and metal-transforming industries has either not been established in those countries or it is of insignificant proportions. Thus, their main task is to diversify and supplement their production structure, which, among many other factors, requires a reasonable capacity to import means of production and its full utilization.

The middle group of countries has made significant progress particularly in certain basic production lines, and there also seem to be favourable prospects of expanding their capital goods industries and their metal-transforming industries in general. Thus in Chile, demand for equipment and machinery for a broader range of activities than the basic industries (which would include the capital goods, copper and chemical industries as well) was expected to reach 535 million dollars in the period 1966-1970.[32] Of this total, it was estimated that 214 million dollars worth, or approximately 40 per cent, could feasibly be produced locally.

The obstacles to attaining these objectives are much greater in the smaller or relatively less developed countries, whose actual investment possibilities are definitely linked to imports of capital goods, although there is a much smaller import content in construction.

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[30] See Automobile Manufacturers Association, *1968 Automobile Facts/Figures*, p. 32.

[31] It should be borne in mind that the existence of a basis of key metal-transforming and intermediate goods industries could largely take care of the expansion and diversification of the basis itself.

[32] *Factibilidad de la producción nacional de equipos industriales de base,* op. cit.

The economic prospects of these countries cannot be discussed without taking regional integration duly into account. This question is of prime importance for all the Latin American economies, as has been made clear in studies on the matter,[33] but there is no doubt that it is particularly significant for the countries in group III. It may be assumed, in fact, that without the complementarity and reinforcement deriving from integration it would be very difficult to complete the initial stages of industrial diversification successfully and reach the stage of producing basic intermediate products and capital goods. In this respect, it is interesting to note the growth of Costa Rica's production of intermediate goods. In the period 1963-1967 the growth rate was 17.6 per cent annually, against an over-all increase of 11.9 per cent. Thus the share of intermediate goods in the structure of production rose from 28 to 34.3 per cent.[34] Central American integration has undoubtedly helped to promote this process.

6. *Utilization of production reserves*

Some analyses are based on the fact that the existing productive resources are fully utilized, except the margins required to preserve the necessary flexibility in the economic system. Thus the only possibility open is to alter their distribution between investment and consumption purposes or to raise the productivity of the resources utilized.

In many developing economies, however, this situation has particular and in some degree contradictory features. On the one hand, they have considerable primary reserves, both human and material, of which little or no use is being made. On the other hand, all kinds of formidable difficulties prevent the combination and incorporation of these elements in the productive process. This is quite a different situation from that prevailing in the industrialized nations in the past few decades, either because they had reached a stage of almost full employment, or because they have not found it difficult to reincorporate their idle, human and material resources in the productive process whenever necessary.

(a) *Rural sector problems*

The main resources which seem to show an appreciable margin of under-utilization in the Latin American countries are labour and agricultural land. This problem may be roughly defined on the basis of some very preliminary data.

As regards labour, it was concluded in a recent study that about 25 per cent of Latin America's active population may be considered to be unemployed, i.e., some 17 million persons.[35] As was only to be expected, the bulk of this redundant labour force is formal in the agricultural sector (59 per cent) and services (see table 8).

Among a good deal of data on land use, the following information was published in the *Economic Survey of Latin America,* 1966:

> "The extensive use of land is characteristic of the latifundios (large multi-family farms). Generally speaking, farm size is in inverse ratio to the proportion of land on which crops are grown by intensive methods. Land under cultivation, including areas used for annual and perennial crops, pasture and fallow land, accounts for 24 per cent of total farm land, but represents only 16 per cent of the land belonging to large multi-family farms . . . Nearly two-fifths of the area under cultivation (or 9 per cent of the total farm land) is left to lie idle. . . .
>
> "As a rule, the existence of idle land is evidence of low levels of technology and farm management, or of a shifting agriculture, characterized by little or no crop rotation but a great deal of rotation of land. The much higher proportion of idle land on the latifundios is not, as might be supposed, indicative of more efficient land use; it merely reflects the widespread practice of rotation of land made possible by the immense size of these estates."

It might reasonably be argued that the mere existence of a reserve of basic resources such as those described above does not mean that they can be utilized, and the best proof of this is that they are not actually in use. It would therefore be necessary to examine, if not the

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[33] See *"La brecha comercial y la integración latinoamericana"*, op. cit.

[34] Costa Rican Planning Office.

[35] This figure was arrived at by calculating underemployment or disguised employment in terms of total unemployment. See the document *"Elementos para la elaboración de una política de desarrollo con integración para América Latina"* (INST/S.3/L.3), chap. II, prepared by ILPES and the Latin American Demographic Centre (CELADE) for presentation at the Seminar on Integration Studies held at Santiago, Chile, in July 1968.

Table 8

LATIN AMERICA: ESTIMATED UNEMPLOYMENT EQUIVALENT, 1960

(Expressed as percentages of the economically active population)

Sector	*Economically active population*[a]	*Unemployment equivalent as a percentage of the population in the sector*[b]	*Share of each sector in over-all unemployment*	
Agriculture, forestry, hunting and fishing	47.0	32.6	15.3	59.5
Mining	1.8	19.0	0.3	1.2
Manufacturing	13.2	16.7	2.2	8.6
Construction[c]	3.9	6.4	0.2	0.8
Electricity, gas and water[c]	3.9	2.0	0.1	0.4
Transport and communications[d]	5.7			
Trade and finance	6.9	19.0	1.3	5.1
Services	17.5		6.3	24.5
TOTAL	*100.0*		*25.7*	*100.1*

SOURCE: *"Elementos para la elaboración de una política de desarrollo con integración para América Latina"* (INST/S.3/L.3).

[a] This structure does not correspond exactly to that of the other sources used in the same document.

[b] Sectors not analysed are left blank.

[c] These figures represent visible unemployment only. They are merely preliminary as they are based on limited data.

causes of this situation—which would entail a review of the whole question of under-development—at least the requisite conditions for tackling and overcoming it, leaving aside the highly important conditions deriving from demand. It is useful for this purpose to distinguish between real conditions and monetary or financial conditions.

Let us assume, in the first place, that an attempt is made to combine surplus labour productively with unexploited land. This combination would require other factors, such as production equipment and certain infrastructure works—buildings, fences, roads, etc.—which to some extent may exist already, or which in any case constitute requirements that can be satisfied without much difficulty by local industry. Moreover, they involve a definite effort on the part of the labour force that has received land. In point of fact, the biggest real obstacles may lie in other directions, such as the physical or geographical separation of the resources which are to be combined, as in agricultural areas where there is plenty of labour but little cultivable land, or *vice versa*.

Other problems emerge when the question is looked at from the financial angle. Although in the association of labour and land some part of the investment, which varies in each case, may materialize without money playing any part in it, this does not always happen: production equipment, for example, must be purchased and future users may not, and probably will not, have the necessary financial resources or savings to acquire it. Furthermore, underutilized land is not free and must be purchased, expropriated or confiscated, and this is where some of the well-known agrarian reform problems are encountered.

In these circumstances, the funds required must come from outside the sector concerned, nearly always from some public or semipublic agency which is ultimately dependent on collective saving accumulated and distributed by the State. Thus the question is linked to a more general one: the State's capacity to accumulate these means, and demand for other purposes. It must not be forgotten, however, that given the existence and possibility of combining unused or partially unused production factors, the increments that may reasonably be expected in the product and income —sometimes within relatively short periods— should help reimburse advances on crops and to increase the whole system's saving capacity.

Inasmuch as the above analysis focuses on how the rural labour force could be used more productively, it undoubtedly also assumes the greater or lesser retention of labour in the agricultural sector. This may appear unjustified or even regressive, in the light of such facts as the persistently high proportion of manpower engaged in these activities (just under 50 per cent in Latin America), the tendency to drift to the cities, and the assumption that a reduction in the proportion of rural workers is in turn a requirement for the diversification of the economies and an indicator of progress in development.

In this connexion, however, consideration should be given to some very specific features of Latin America's general development which distinguish it from the classic forms of development, particularly in the major European countries. First, as a result of accelerated urbanization, population growth, migration from rural areas, the slow growth of demand for industrial manpower, and other factors over the last few decades, a reserve of human resources has gradually been built up in urban centres, especially in the large cities. Thus, productive absorption of these marginal groups has become a difficult problem which will only be aggravated if in-migration continues and is intensified.

A reasonable answer would be the creation of other opportunities of adequately paid employment in agricultural activities (and also in the smaller towns) in order to put at least a temporary stop to the increase in urban population.

Prospects of retaining and using labour productively in rural activities depend decisively, *inter alia,* on the system of land tenure, the types of crops or farming, and the nature of the technical know-how which is introduced and spread. As regards the land tenure system, the predominance of the minifundio-latifundio complex means a relative surplus of manpower in the former and scant labour absorption in the latter. On this basis, the point of departure adopted in a study on land tenure[36] prepared by the Inter-American Committee for Agricultural Development (CIDA) is the ratio of agricultural land to the number of workers on family-type farms in each country, the following conclusion being arrived at:

> "If this 'desirable' land/labour ratio existed on minifundios, only 700,000 of the 4.4 million workers on subfamily-type holdings would be required in six of the countries studied (except Peru, for which no data were available). If the land/labour ratio at the family level were applied to only half the area of the latifundios (on the generous assumption that half this land has no economic potential), it would be possible, with existing resources, to employ an additional 25 million workers in the six countries. These approximate estimates reveal the heavy pressure on land in the minifundios and the ample possibilities of improving the use of land and labour on large-scale units."

As regards the type of crops, it is also generally accepted that the transition from the traditional extensive agriculture to more intensive farming with a dynamic demand (fruit, vegetables, milk products, etc.) would open up good prospects of stable and better paid employment.

Lastly, as regards technical know-how, it was stated in a recent study[37] based on FAO estimates regarding possibilities of boosting productivity without involving manpower shifts that merely by effectively combating pests, insects, etc., the region's agricultural production would increase by 20 per cent; that in addition, the more widespread use of fertilizers and the proper use of existing irrigation water under a sound irrigation system that would also operate at night would be enough to boost production by at least another 20 per cent; and that it had been noted in Central America that although seeds and irrigation remained static, the use of fertilizers had resulted in a 120 per cent increase in maize production in Honduras and an 80 per cent rise in Costa Rica's rice output.

(b) *Urban sector problems*

Different and more complex problems arise in the incorporation of redundant manpower in urban sectors, both large and small cities.

There are many opportunities of using redundant manpower in activities identified with their own interests, as can be seen from self-help methods of construction and community improvements. In these cases, financing and supplementary material resources requirements are usually fairly modest. Without in any way underestimating the social importance of this type of mobilization and its direct and indirect economic repercussions, it may be argued that these systems do not solve the essential problem, i.e., to provide the disposable labour force in urban areas with stable employment and incomes. As distinct from the agricultural sector, there is no other basic resource such as land which could be associated with idle manpower.

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[36] L. Barraclough and A. Domike, *"La estructura agraria en siete países de América Latina"*, Trimestre Económico, No. 130 (Mexico City, 1966).

[37] See *"Elementos para la elaboración de una política de desarrollo con integración para América Latina"* (INST/S.3/L.3), chap. IV.

In principle, it would seem reasonable to suppose that the utilization of the wholly or partially redundant labour force in the cities depends on whether it can be absorbed by industry, construction and relatively skilled services. An obstacle to such absorption, however, is that it presupposes an adequate supply of basic goods and services for the inflow of this urban reserve. In this respect, the emphasis has been placed on the need to increase the supply of foodstuffs, on which the demand created would mainly exercise pressure. This is a distinct need and on this point there seems to be a close connexion between urban and rural employment problems. In any case, it must be remembered that the urban reserve already exists in the cities in some form and degree, and the aim is to be able to satisfy the additional demand which should derive from more regular and more favourable employment conditions.

A second factor is that this population is usually made up of workers lacking education and skills, which makes their absorption in the more demanding city environment more difficult.[38] Hence the high priority attaching to adult training programmes, and to regular education for children and youth in the marginal urban sectors. It would be wrong, however, to think that the problem can be solved only over the long term. The requirements for many potential jobs are not beyond the capacity of part, and sometimes a significant part, of the available labour force. Moreover, the question must be considered within a dynamic perspective, in which the opportunities for short-term absorption involving little manpower training are combined with measures and programmes designed to improve skills.

If the above factor is connected with evident difficulties on the side of manpower supply, those affecting demand for labour are probably even greater. In other words, it may be assumed that the degree of under-utilization of this human reserve stems less from intrinsic causes than from extrinsic factors, particularly the number and type of employment opportunities which the community has to offer.

Construction is a case in point. This sector is usually one of the main sources of employment for unskilled workers, who sometimes learn enough there to go on into industry. Although construction accounts for a relatively large share of investment in Latin America, it does present some negative features such as the traditional fluctuations in these activities, which to a great extent follow the vicissitudes of fiscal policy and expenditure in this sector. Added to this, and partly as a consequence of it, construction enterprises lack stability and continuity. Another factor is that the construction of high-cost dwellings absorbs a large proportion of the investment in this sector and has a lower content of expenditure on labour than that recorded in low-cost housing or in construction designed to improve the social infrastructure in the urban periphery.

Similar problems arise, and perhaps more frequently, in industry.[39] The relevant data are quite clear. First, employment in this sector accounts for a relatively low share of urban employment.[40] Secondly, the absorption of labour in industry has been somewhat slow. Lastly, the employment increments in factory industry proper have been offset by the very slight increase in artisan employment. As a result, the share of industrial employment in total non-agricultural employment was smaller during the 1960s than, for example, in the 1940s.[41]

(c) *Under-utilization of capital*

As against these circumstances, it should be borne in mind that industry in general has real additional possibilities of absorbing more labour. From the incomplete data available it may be assumed that manufacturing plants have considerable idle production capacity.[42] In Argentina, for example, a survey carried out by the National Development Council (Consejo Nacional de Desarrollo—CONADE) covering the years 1961-1964, show that production fluctuates widely over the short term, but a large proportion of the installed capacity remains idle, even during periods of expansion. To cite a few cases, the actual production of the food and metal-transforming industries was about 50 per cent short of their possible maximum output. A study carried out in Colombia in 1963 reveals that production capacity in industries such as textiles was being utilized satisfactorily, while the chemical metal-transforming and metallurgical industries had a considerable unexploited potential. In a survey of Chile in 1957—a period of relative economic depression—the Development Corporation concluded that the over-all utilization of industrial capacity was 57 per cent, and assumed that the actual maximum employment capacity could not be more than 81 per cent of the theoretical maximum. In a study of Ecuador, the National Planning Board estimated that approximately 41 per cent of industrial capacity was under-utilized in 1959 and 1961. Lastly, an industrial survey conducted in Venezuela in 1961 provided details of a wide range of industries which were operating at less than half their full capacity.

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[38] Although rural manpower may be even less skilled, this is probably more than offset by the fact that the requirements placed on it are also less stringent.

[39] See, in particular, *The Process of Industrial Development in Latin America* (United Nations publication, Sales No.: 66.II.G.4), pp. 74-83.

[40] This situation is partly due to what is generally termed "over-urbanization" in some Latin American countries, in the sense that migration to the cities was more rapid than both the growth of agricultural productivity and the industrial expansion compatible with income levels and distribution.

[41] See *The Process of Industrial Development in Latin America*, op. cit., pp. 35-45.

[42] *Ibid.*, see especially the Statistical Annex, tables II-13 to II-17 (mimeographed). The data given here come from this source.

These data on under-utilization of industrial capital should be carefully studied. First, it must be remembered that a certain balance tends to be struck between surplus national assets in certain sectors and activities and bottlenecks in others. Thus an appraisal at the enterprise level may not be valid at the level of the over-all system. Secondly, excess capacity may exist in certain areas, as a result of technological conditions or investment cycles. Lastly, industry, with its existing potential, may at a given moment be unable to obtain key imported components in sufficient quantities.

In any case, it seems reasonable to assume that there is a certain margin of capital reserves, which suggests that this factor's limitations are not the root cause of the problem under consideration, i.e., the absorption of more labour.

One of the causes is undoubtedly the effects of industry's dependence on imported know-how, a question whose importance has already been underlined in ECLA's earliest documents.[43] This situation has a two-fold effect: first, to reduce the demand for manpower in relative terms and, secondly, to raise the requirements for the small segment absorbed. These two circumstances mainly affect the huge marginal, or virtually marginal, sector of the population, making it progressively more difficult for them to obtain employment in technologically advanced activities.

Another cause, which is closely associated with the previous one, is that industrial expansion, particularly in the last two decades, has been based essentially on the so-called dynamic industries with a high technological content and a small absorption of manpower, which is usually highly skilled. Conversely, the traditional industries, which still absorb about 60 per cent of the workers employed in manufacturing, have grown at a sluggish pace and have gradually lost ground (see table 9).[44]

If a comparison is made between groups 1 and 3 (traditional industries and metal-transforming industries), which present the biggest and clearest disparities, it will be seen that, although the latter have grown more than three times as fast as the former and have virtually doubled their contribution to the gross value of manufacturing production, their share in employment increased only moderately (from about 18 per cent in 1950 to a little over 21 per cent in 1960).

These factors are largely determined by the structure and evolution of demand and, therefore, by income distribution. This explains the rapid growth of the more labour-saving dynamic industries, particularly those producing durable consumer goods—including the bulk of the motor-vehicle industry—which absorb a sizable proportion of the supplies of intermediate and capital goods. On the other hand, the traditional industries and those producing non-durable consumer goods, besides being specially influenced by the absorption of technical know-how, are restricted by the absolute level and slow growth of income of the bulk of the population.[45] Thus, employment opportunities in industry are limited by a number of different circumstances.

(d) *Technology, employment and income distribution*

Some reflection is necessary in order to evaluate the options for increasing the absorption of urban labour in industry.

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[43] See, for example, "Theoretical and practical problems of economic growth" (E/CN.12/221).

[44] *"Elementos para la elaboración de una política de desarrollo con integración para América Latina"*, op. cit., chap. V, table 9.

[45] In fact in the lowest stratum of the income distribution scale, which includes 50 per cent of the population, there is practically no demand for consumer durables. These goods represent only 3 per cent of total consumption of the middle stratum, or 45 per cent of the population. See *The Process of Industrial Development in Latin America*, op. cit., pp. 114-154.

Table 9

LATIN AMERICA: STRUCTURE OF EMPLOYMENT AND OF GROSS PRODUCTION VALUE, 1950 AND 1960

Type of industry	*Structure of employment*		*Structure of gross production value*		*Base of growth of industrial production*	
	1950	*1960*	*1950*	*1960*	*1950-1955*	*1955-1960*
1. Traditional industries (ISIC major groups 20-26 and 29)	64.8	59.6	64.0	50.2	3.9	3.9
2. Intermediate goods industries (ISIC major groups 27 and 30-33)	10.8	12.9	18.5	22.3	8.4	8.5
3. Metal-transforming industries (ISIC 34-38)	17.8	21.2	13.8	24.7	11.7	13.8
4. Miscellaneous industries (ISIC 28 and 39)	6.6	6.3	3.7	2.8	4.4	6.5
TOTAL	*100.0*	*100.0*	*100.0*	*100.0*		

SOURCE: Latin American Institute for Economic and Social Planning, on the basis of national data.

For the sake of simplicity, it may be assumed that the opportunities for absorbing these groups depend basically on the traditional industries, for which there are two requirements: that their growth rates should increase considerably, and that the introduction of labour-saving techniques should not cancel out the effects of such growth on employment.

An ECLA study[46] presents rough estimates of the effect of a given redistribution of income on industrial production.[47] While over-all growth would be much the same as that attainable without altering the distribution, the growth rates of the various groups of manufactures would be quite different, since demand for traditional goods would increase far more rapidly. This would constitute the first prerequisite for the industrial sector to step up its labour requirements.

It is therefore assumed that production of consumer durables would grow at a slower rate, parallel with population growth in the high-income group. Apart from the fact that this would not depress the over-all rate of industrial expansion, however, this relative lag would be unlikely to affect the intermediate and capital goods industries except in the very short term and not always even then. These industries should also gain momentum in response to the demand deriving from the redistribution of income—production of food, equipment, economic and social infrastructure—or connected with other economic policy aims, in particular export promotion and regional integration.

It must not be felt that the labour absorption goals imply a kind of technological freeze. This would be at variance with the more general and far-reaching need (for example, in the real distribution of income) to raise productivity and reduce the absolute or relative prices of a large proportion of essential goods, and to promote exports.

On the contrary, it would be necessary to explore various possibilities of raising the productivity of manufacturing plants, which would be assumed to have different affects on the volume of employment. The question is quite clear in the agricultural sector,[48] but it is considered less relevant in other activities, such as industry. Particularly in the traditional industries, however, and more precisely in medium- and small-scale enterprises, there is ample scope for progress in techniques, organization, management, personnel training, forms of financing, degree of utilization of installed capacity, etc., which could improve the productivity of the labour force and other resources without greatly affecting the supply of capital.[49] Of course, all this is based on the fundamental assumption that demand will duly expand in line with the changes in income distribution.

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[46] *Ibid.*, chap. IV, table 43.

[47] Based on doubling the domestic product and "keeping absolute per capita consumption levels constant in the higher income groups, while the middle and lower income strata would enjoy equal shares in the total consumption increment, which in practice means the rise in income in the last-named population group would be much greater in relation to present levels" (*ibid.*, p. 243).

[48] See the discussion on the subject in "Theoretical and practical problems of economic growth", op. cit.

[49] ". . . what has been termed the backwardness of the Latin American textile industry and has been generally attributed entirely to equipment is partly

Even in cases where productivity increments require the installation of labour-saving equipment, there are also different possibilities as regards the effect on employment. This is clearly seen in ECLA's studies on the textile industry in Latin America,[50] where a comparison is made between the main results of applying three different levels of technology, corresponding in general to capital intensity per worker employed in 1950, 1960 and 1965.[51] Table 10 summarizes the effects and relationships of these basic options. It will be noted that the option showing the highest capital investment involves a marked reduction in the number of workers employed per unit of output, which in some degree could be offset by an increase in the number of units produced. Although under this option the value added per person and the surplus for reinvestment are considerably higher (which means a better return on capital), investment per worker also rises substantially, the product-capital ratio drops, and there is only a small reduction in unit costs. Moreover, the bigger surplus for reinvestment per worker is not sufficient to cover the difference in investment per person employed. For these reasons, and especially because of the effect on employment, the middle option, or option B, was considered the most desirable in the above-mentioned study.

The whole question of technological options should be related to other more general aspects of development. First, since the domestic resources that can be used to step up productivity are limited, they should be distributed in accordance with priorities for the whole economy and not for a particular sector or enterprise. This problem is at once simple (at least in presentation) and complex (because of the difficulty of objectively measuring the social productivity of investment). A kind of technological compulsion exists in many activities, however, in that only one or a few options are open to the supplier centres. At the same time other activities, such as export industries or the main intermediate goods industries, must operate with the most up-to-date technical know-how.[52]

Table 10

SUMMARY OF THE PRINCIPAL EVALUATION COEFFICIENTS AND OTHER INDEXES AFFECTED BY THE LEVEL OF TECHNOLOGY, AT PRESENT FACTOR COST

	Index numbers/ Technological options		
	A	*B*	*C*
Unit cost	100	92	89
Unit investment	100	109	115
Product-capital ratio at cost level[a]	100	76	68
Product-capital ratio (total)[b]	100	92	87
Investment per person employed	100	190	310
Employed persons per unit of output	100	57	37
Value added per person employed	100	145	211
Surplus for reinvestment	100	119	126
Required total investment[c]	100	127	146

[a] Excluding gross profit.

[b] Based on estimated gross profit.

[c] Total investment required for minimum economic plant size.

In the light of these facts it would obviously not make much sense to increase the capital per worker in activities which do not have the above-mentioned characteristics and which are of key importance from the employment standpoint, although this does not mean that productivity levels in the traditional or other industries of the same standing should be frozen.

(e) *Opportunities in services*

It may be assumed, in principle, that the services sector would not be able to absorb

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due to the lack of organization and administration in the mills, although these conditions, as will be shown later, do not depend merely on the will, or on the administrative capacity, of the manufacturers. In the Latin American countries which are unable to purchase new equipment because of their scanty savings capacity, or because they must divert capital to more pressing needs, the significance of administrative deficiency in the textile mills shows that there is still a wide margin to increase productivity without recourse to substantial investments." See ECLA, *Labour Productivity of the Cotton Textile Industry in Five Latin American Countries* (United Nations publication, Sales No.: 1951.II.G.2), p. 5.

[50] See in particular ECLA, "The choice of technologies in the Latin American textile industry" (E/CN.12/746), 1966, and *La industria textil en América Latina. XII. Informe regional* (United Nations publication, Sales No.: S.68.II.G/Mim.10).

[51] Investment per person employed was about 6,600 dollars in 1950, 12,700 dollars in 1960, and some 20,000 dollars in 1965.

[52] See "Theoretical and practical problems of economic growth", op. cit.

much of the surplus labour. In fact, it is common knowledge that development in Latin America in general, and of the more urbanized countries in particular, has been characterized in the last few decades by a considerable increase in the number of persons employed in services. Thus the point has been reached where "in Latin America's employment structure the proportion of the persons employed in services is similar to or even larger than in countries with a higher income level".[53] This sector actually absorbed 30 per cent of the total increment in the labour force in the period 1925-1950, and over 40 per cent in 1950-1960.[54]

The aim should be, however, not to reduce the proportion of persons employed in services, but mainly to change the composition of the sector so that the population employed in it will have higher and more stable incomes and the national product will eventually increase.[55]

For purposes of this discussion it is useful to distinguish the main subsectors in this group of activities, i.e., basic services (normally associated with the production of goods), commercial and financial services, government services, and miscellaneous services (including unspecified services).

Commercial and financial services are a fairly important source of employment and usually absorb more people than the apparent or operational requirements for the production of goods. At the same time, and particularly in the 1960s, there has been a marked trend towards the modernization and mechanization of these activities through the widespread establishment of supermarkets, the introduction of up-to-date mechanical equipment in financial institutions, etc.[56]

It would be easy to criticize some manifestations of this process—especially the large-scale introduction of mechanized office procedures—in the light of the above comments on technological options; but having gone so far, it is difficult to reverse the trend of event.

There are therefore grounds for supposing that this sector's absorption capacity will diminish and that, on the other hand, the differences within it will become more marked, with a modern area and a very backward area, consisting mainly of small- and medium-scale commercial activities. Thus, a proportion of those employed in the latter area should be transferred to other activities or to other more productive and better paid services.

Miscellaneous services range from professional to domestic. Together with unspecified activities, they absorbed about 22 per cent of the increase in the labour force (or over half the proportion incorporated in the whole of the services sector) between 1950 and 1960. The size of this employment area where a large proportion of disguised unemployment is found, is presumed to have increased since 1960.[57]

In some degree, the opportunities in this subsector of going on from the less skilled services to other better paid ones are by no means negligible. A case in point is the female labour employed in domestic service which is gradually moving into commercial or industrial employment.

At first sight, public services seem to offer insignificant employment possibilities in view of the deep-rooted assumption regarding the excessive scale of government employment. Nevertheless, according to a study on the subject, "government services in most Latin American countries have not developed unduly from the employment standpoint. In fact, from 1925 up to the last few years the government sector has absorbed much the same proportion —about 5 per cent—of the total increase in the labour force (5.1 per cent in 1925-1950 and 5.2 per cent during the fifties)".[58]

The question should be examined in the light of the growing need for collective services, which goes hand in hand with intensive urbanization such as that occurring in Latin America. From this point of view, there seems to be general agreement that police protection, refuse collection, health, postal and other services of this kind have deteriorated at least in relative terms, in many urban centres, particularly in regard to the marginal population.

Manpower absorption in these activities gives rise to new financing problems for national and municipal governments. The importance of these functions should, however, be taken into account vis-à-vis other types of private or public expenditure. To a certain extent, the same situation is occurring in the Latin American countries as that described by J. K. Galbraith,[59] in the sense that the expansion and diversification of individual consumption have been accompanied by an absolute or relative deterioration in many public services or facilities of great importance to the community.

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[53] See *The Economic Development of Latin America in the Post-War Period*, op. cit., p. 31.

[54] See "Structural changes in employment within the context of Latin America's economic development", *Economic Bulletin for Latin America*, vol. X, No. 2 (October 1965), pp. 163 *et seq.*

[55] This measure would be combined with movements of some of these persons to other areas such as those analysed above.

[56] See "Structural changes in employment within the context of Latin America's economic development", loc. cit.

[57] *Ibid.*

[58] *Ibid.*

Nor does the relative importance of public expenditure appear to have increased if its evolution is compared with the trend of the domestic product between 1960 and 1966. In this connexion, it is stated in an ECLA annual Survey[60] that ". . . the supply of goods and services does not seem to have been under heavy pressure from public demand, and, where this did happen—in Mexico—it coincided with steady growth on the part of the over-all product. In other countries where expenditure had a positive elasticity during those years (e.g., Brazil and Chile), sharp fluctuations took place with high rates of expansion followed by severe contractions or *vice versa*".

To sum up, the question asked at the beginning of this section can be answered by saying that the Latin American economic systems really do have vast human and material reserves which, if duly mobilized and absorbed, could do a great deal to promote development. Without underestimating the problems involved, it may reasonably be maintained that they should not be insuperable for a policy under which these objectives are pursued with intelligence and tenacity.

II. ACCUMULATION AND CHANNELLING OF FINANCIAL RESOURCES

It is not sufficient merely to be aware of the real resources or conditions of an economy to be able to assess its capacity to form producers' capital; it is also necessary to study the financial means of realizing that potential or, in other words, the proportion of its current income that the community or its economic agents set aside in order to finance investment.

Real conditions have little or nothing to do with financial conditions. At any given moment, a country's real possibilities for investment may exceed its saving potential for example, in the event of an economic recession involving a decline in incomes and in opportunities or incentives for forming capital.[61] On the other hand, the financial resources might be available and yet not be channelled into investment owing, for example, to a limited import capacity or to the resources being earmarked for consumption or external capital formation.

Though it is difficult to measure investment potential with any accuracy, it must be borne in mind that one of the general objectives of a development policy is the mobilization of a corresponding volume of financial resources so that full and more productive use can be made of that potential in terms of the qualitative aims of the policy.

Assuming that there is a real basis for stepping up capital formation and the incorporation of resources in the productive process, it would be useful to know whether the financial means for attaining this objective can also be found.

1. *Level and distribution of income*

One of the factors most commonly referred to in analyses of the savings situation is the level and distribution of income. It should not be necessary here to repeat the various generalizations that have been made regarding the connexion between investment rates and income levels, generalizations which are also applicable to the savings potential. On the other hand, it would be as well to discuss this potential in the Latin American context.

As an initial approximation, the extreme, and undoubtedly unrealistic, hypothesis that any excess income over a certain income or basic consumption level represents the savings potential should give an idea of how little room there is for manoeuvre in dealing with the so-called "vicious circle of poverty", or, in other words, of what little hope there is of altering the proportions of consumption and savings at any given moment.

A comparison of average per capita incomes in different regions places Latin America somewhere between the relatively less developed areas, like Asia and Africa, and the industrialized countries. Early in the 1960s, the per capita income was reckoned at 420 dollars—a quarter of that of the developed countries but three times that of the most backward regions.[62]

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[59] See John Kenneth Galbraith, *The Affluent Society* (Boston, Houghton Mifflin, 1958).

[60] *Economic Survey of Latin America*, 1967, op. cit., p. 100.

[61] In this case, a compensatory policy—through public expenditure, for instance—would restore or raise the level of use of investment potential.

A recent survey attempted to work out what the "minimum income" would have to be for a person to have minimum access to the opportunities afforded by a modern civilized society, bearing in mind what would be a feasible objective, given the present state of development of Latin America.[63] The estimates given, based on ECLA's studies of income distribution, indicated that more than 40 per cent of the population of Latin America—or slightly over 100 million inhabitants—were unable to afford goods and services equal in value to that minimum figure.

It is important, however, to remember the other side of the picture: that just over 50 per cent of the same population is above this level. For example, the annual per capita income in the intermediate group, representing two fifths of the population, was not much more than 300 dollars, while the top fifth had a per capita income of 1,130 dollars and, moreover, accounted for about 56 per cent of total income.[64]

Certain exceptions aside, it seems reasonable to conclude that absolute per capita income levels in Latin America place the region in a relatively favourable position compared with the more backward areas and that, despite the serious problems of under-consumption affecting slightly less than half the population, a sizable savings potential exists in the income of the remainder, particularly among the top income group, which would be all the greater if the income levels of these groups were raised. Similarly, the latent savings potential or volume of savings that could be mobilized for other purposes than a given basic consumption would be greater in countries where the average income was higher or the differences of income more marked.[65]

The situation becomes much clearer when seen from the aspect of income growth. Wherever income increases more rapidly than population, it becomes easier to alter the marginal relationship between consumption and savings. In other words, bearing in mind that this situation has developed in Latin America over the past few decades, it would be possible to raise the proportion of additional income set aside as savings without affecting the absolute level of per capita consumption, even perhaps allowing for an increase that would be compatible with the stated objective.

The foregoing is closely allied to the social distribution of income, a fact which is sometimes overlooked by those who stress the difficulty of restricting consumption and increasing savings in countries with a low per capita income. The truth of the matter is that in these countries a fraction of the population not only has a high absolute level of income but accounts for a large portion of the national income. This being so, it is fairly obvious that this is where the bulk of the savings potential is to be found.

2. *Inequalities in the distribution of income, consumption and savings*

It is usually claimed that a certain unspecified degree of inequality in the distribution of income and, ultimately, expenditure is useful or inevitable if suitable incentives are to be provided for increasing productivity.

It is difficult to ascertain the general validity of this claim, since it would be just as unrealistic to set complete equality as to suggest that the entire margin of income above a certain minimum level actually represents potential savings. Consequently, it would be more useful to concentrate on the seriousness and extent of inequitable distribution.

For this purpose, reference can be made to the data contained in an earlier ECLA publication, *The Economic Development of Latin America in the Post-War Period*,[66] which compared the distribution of personal income in Latin America, Western Europe and the United States, dividing the income brackets into three categories: the top 5 per cent, the middle 45 per cent and the bottom 50 per cent of the population. Table 11 shows their relative position, where base 100 corresponds to the income of the top income group.

From this it can be seen that the differences between the income groups are far greater in

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[62] See United Nations, *The Economic Development of Latin America in the Post-War Period*, op. cit., table 51. Apart from the United States and Western Europe, the developed countries included Canada, Australia, New Zealand, Japan and South Africa.

[63] See the documents prepared for the Seminar on Integration Studies organized by ILPES and CELADE and CLACSO in 1968.

[64] *Ibid.*

[65] Needless to say, there is no clear-cut ratio between income levels and the rate of saving. Despite the differences mentioned, the demonstration effect tends to stabilize the level of savings in developed economies.

[66] Op. cit., table 55.

Table 11

DIFFERENCES IN PERSONAL INCOME BETWEEN SOCIAL STRATA

(Percentages of the income of the top 5 per cent of the population)

	Top 5 per cent	*Middle 45 per cent*	*Bottom 50 per cent*
Latin America	100	17	4.8
Western Europe	100	28	10.1
United States	100	31	11.5

SOURCE: *The Economic Development of Latin America in the Post-War Period* (United Nations publication, Sales No.: 64.II.G.6), table 55.

Latin America than elsewhere. The top 5 per cent of the population, for example, have a per capita income that is over twenty times higher than that of the bottom 50 per cent, whereas in Western Europe and the United States it is only ten and nine times higher, respectively. This not only corroborates the fact that income distribution is relatively more unequal in Latin America but proves that a reduction of this inequality is in no way incompatible with the requirements and incentives of a modern economic society.

This does not mean that the kind of income structure that exists in Western Europe or the United States should necessarily be advocated; it does, however, illustrate the significance what the "surplus income" being absorbed by the high income groups would mean if it was translated into savings potential. It is not the intention of this analysis, either, to overlook or underestimate the savings potential of the middle and even the lowest income groups, since recent experience in Latin America has shown that this is an important factor and that it can be mobilized by means of suitable machinery and provisions designed to attract and collect small but very numerous fractions of excess income.

If the concentration of income in Latin America has come in for so much attention, it is essentially because of the opportunity it affords for increasing the volume of resources available for investment, and not just for the sake of a redistribution policy. Whereas the latter advocates a pure and simple transfer of income, directly or indirectly, from the top income groups to the bottom—which would probably be ineffective and perhaps even counterproductive—this analysis points rather in another direction, namely, towards the channelling of as much excess income as possible into savings and investment so as to expand productive capacity, promote technical progress, provide greater employment opportunities and attain other objectives that have a profound effect on the basic causes of the unequal distribution of income.[67]

It is worthwhile remembering that, some time ago, one of ECLA's most widely circulated documents gave an assessment of the possible implications of a reduction in consumption by the high income groups so as to bring the inequalities mentioned above more in line with the pattern of the developed countries. It commented: "In fact, if consumption by the upper strata were brought down to not more than eleven times that of the lower strata, the annual per capita income growth rate could be raised from 1 per cent to 3 per cent, and if it were only nine times as great, the annual per capita rate could rise to 4 per cent."[68]

One last aspect worth noting is the relationship between the concentration of income and the formation of savings. It is sometimes claimed that the former has a vital influence on the latter, since the high-income groups could set aside a relatively large share of their income for other purposes than current consumption. Without discounting this factor altogether, it must be remembered that it operates in a very special way in developing countries.

On the one hand, this contention underestimates the demonstration effect of the consumption patterns of the industrialized countries on the expenditure of the high-income groups. Since, with some exceptions, their average income is generally lower than that of their counterparts in industrialized economies, the attempt to copy the consumption patterns of the latter is a much heavier burden on their income, all the more so because the goods concerned are in any case more expensive than in industrialized countries whether produced domestically or imported (when their prices are increased by customs duties and taxes). Thus the hypothetical savings potential afforded by the relatively high income of these groups is rather less than would appear.

On the other hand, it should not be forgotten that marked inequality is a highly expensive formula or mechanism for promoting savings. Leaving aside its obvious social repercussions, a simple illustration will prove the point. Assuming that 10 per cent of the total income of the high-income group and 20 per cent of any marginal increase in that income is set aside for savings purposes, this would mean that, in order to obtain a single additional unit of savings from this source, the income of this group would have to be increased by five units. In other words, four units would be channelled into consumption.

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[67] See ECLA, *Estudios sobre la distribución del ingreso en América Latina* (E/CN.12/770 and Add.1).

[68] See Raúl Prebisch, *Towards a Dynamic Development Policy for Latin America* (United Nations publication, Sales No.: 64.II.G.4), p. 32.

3. *Domestic and external savings potential*

Information on the level of average incomes and their concentration is essential to an evaluation of the savings potential. However, these factors do not have the same meaning in industrialized as in developing economies since, while in the former the resources set aside for investment normally correspond to a material capacity to create capital, this is not the case in developing countries, where, to a more or less decisive extent, fixed investment—and particularly investment in equipment and machinery—depends on imports that cannot easily be replaced by domestic production.

In these circumstances, it is not enough for there to be an excess of income over current consumption expenditure; the surplus must also be convertible and used to purchase imported capital goods. It would be easy to imagine a country whose general savings potential is relatively low on the basis of the variables mentioned above and yet fairly high if allowance is made for its capacity to import and for the role played by external means of production in its capital formation. By contrast, there might be an economy with a larger general savings potential which cannot easily be used for real capital formation because the country's external payments capacity is insufficient to enable it to pay for its capital imports.

When external trade is fairly free or the composition of imports is relatively easy to change, there is no marked difference between the problem of external saving potential and that of domestic or total saving potential. The situation however is not at all the same when external trade is restricted while at the same time there are plenty of possibilities of domestic saving.

In such circumstances, the first reaction of some countries has been to step up import-substitution so as to keep the available foreign currency for financing the most vital capital or consumer imports. Another reaction has been to resort to foreign contributions, i.e., to the financing of part of the investment needs with external savings, in which case the savings and financing situations are not the only—at times not even the essential—considerations involved. Thus, economies which in theory have had enough foreign currency to meet certain investment needs (particularly in the so-called dynamic sectors) have sometimes failed to do so because the internal conditions for it were lacking, with the result that the opportunity was seized by foreign investors.

Whatever the situation and though the differences may be great, it is important not to overlook certain underlying contradictions in the use of external financing for investment purposes.

One such contradiction relates to the kind of foreign investment that is not aimed at exports but is highly productive of income, so that it affects the country's external payments capacity through the cost of inputs or the servicing of the foreign capital. Paradoxically, the greater the income-effect of these activities, the greater the possible pressure on the balance of payments. When this happens and when there is no real possibility of paying the profits on the foreign capital, the foreign investor will have no other alternative than to use his surplus resources to acquire other national assets or enterprises.

The other possibility relates to foreign investment whose net effect on foreign payments capacity is favourable, either because it increases exports or because it cuts down expenditure on imports or other items.

Because the cost involved is lower and because the repayment periods are different and the loans can eventually be paid off, inflows of government financing and non-compensatory capital present a different picture. In the short- and medium-term, however, the problem remains roughly the same.

The crux of the matter clearly seems to be the effect that the use of foreign capital to augment the savings potential has on exports or on the external payments situation—which explains why studies on regional and international trade devote so much attention to it.

4. *Turning savings into investment*

Because the relationship between savings and investment is rather more complex than is generally imagined, it would be well here to focus attention on certain aspects that have taken on particular importance.

First and foremost, there is the widespread belief that all saving necessarily goes into investment, so that any increase in the former is automatically followed by a corresponding rise in the latter. The falseness of this supposition, however, can be easily seen; in practice, often a big gap between the expected level of saving and actual savings. Over a given period, economic units or agents often find themselves with a surplus on current account, i.e., a credit balance after all ordinary or consumption expenditure has been covered, which is not necessarily used for any kind of real capital formation. Naturally, as has been pointed out in the past, this surplus may be hoarded, but nowadays this is probably much less frequent than it used to be. The credit balances are far more likely to be channelled by some intermediate economic agent into the financing of the consumption or the operational demands of other economic units eventually. One of the most common ways in which this happens seems to be through time deposits, which, as will be seen below, has increased appreciably in several countries. Time deposits are one of the basic forms of personal saving, but the banks and financial agencies that receive them may use them for purposes other than the formation of producers' capital.

The problem does not end with personal savings. In fact, it applies to every form of financial investment and may therefore reappear at the level of the business enterprise or even of the government itself. Both sectors can, and to a certain extent do, use part of their surpluses on current account, for example, to lend to their consumers or, in the case of the government, to purchase existing assets. In these circumstances, what—from the point of view of the economic agent involved—seems to be saving (and investment), no longer serves as such at the national level or on the final balance-sheet. Looked at this way, only the total volume of investment in fixed capital and stocks of goods can be considered as real savings.[69]

Although these aspects are not new, they deserve especial attention because of the increasing importance which the financing of current operations in general, and of consumption in particular, is acquiring in diversifying economies.

The phenomenon just referred to can be illustrated by one of the most important forms that development has taken in several countries over the past few years: namely, the establishment or expansion of a sector providing heavy and expensive consumer durables, such as motor vehicles, television sets and refrigerators. Much more capital is required to finance the production of such goods than the marketing of the products of traditional industries, such as the production of foodstuffs, clothing, beverages, etc. Generally speaking, the consumer has to be financed if he is to purchase the newer types of product, and the smaller the market effectively provided by groups with high incomes or an adequate balance of income over expenditure, the higher will be the problem. Failing this kind of market—on which the mass consumption of developed countries is based—the expansion of the higher-priced consumer durables market tends to depend almost entirely on the extension of greater financial facilities and the expansion of the monetary resources needed to provide them.[70]

Basically, then, savings and other financial sources, including external credit, are absorbed by this type of expenditure and thus become unavailable for any possible direct contribution to the formation of producers' capital.

The problem, however, is not solely one of consumption financing. There is also the repeatedly mentioned fact that the diversification of the productive system, which is one of the changes leading to an industrialized society, entails major changes—in both qualitative and quantitative terms—in the financial sector.

First, greater resources are needed to cover the current financing of the system, which tends to outstrip the flow of goods and services. As the number of intermediate steps and stages between the production of primary commodities and that of finished industrial goods increases, the coefficient of direct and indirect financial requirements per unit of end products automatically rises with it.[71]

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[69] The more complex possibility, which is less common in these countries, of the surplus being invested abroad is not dealt with here.

[70] Most analyses of Latin America's experience in this respect point out that the growth of import-saving industries, especially in the consumer durables field, go through two distinct phases: rapid expansion, during which they rely on the pre-existing demand of the high-income groups; and a period of more difficult growth during which they endeavour to maintain demand by extending purchasing facilities to new groups and widening the original market. A typical example of the latter phase is the way in which the image of a "second family car" spreads through developed economies only when they have attained a high level of income, and is already becoming an aspiration in Latin American countries where the average income is only a fraction of that of the developed countries.

Secondly, the fact that some of the inputs and capital goods that used to be imported are produced domestically means that supplementary resources must be found for investment that used to be largely covered by external financing (in the form of suppliers, credits, for example), quite apart from the fact that the cost of domestically produced goods is generally higher and imposes an additional financial burden.

Finally, it is important not to forget that progress towards new forms of import-saving industrialization usually involves stepping up requirements of both fixed assets and financial capital. The mere fact of modifying the productive structure in a way which increases the number of heavy or more capital-intensive industries operating on a larger scale and with longer lead periods means that a far greater volume of financial resources will be tied up in them. One of the most immediate obstacles to the best use being made of the investment potential of the basic sectors is precisely the difficulty of guaranteeing them sufficient financing and a large enough demand on a continuing basis.

Though the fact that much of the investment in the dynamic sectors may have come from foreign enterprises does not greatly alter the problem, it does give it a special connotation. Basically, external resources represent imports of equipment. Once the plants have started operating, the foreign enterprise (which is usually the most important, if not the only one in the sector), has ample capacity for self-financing, thanks to the enormous profit it derives from its virtual monopoly of the domestic market and to the fact that it is in a privileged position for borrowing from the national banks to cover its current financing needs. Thus, if a distinction is made between the ownership of the assets and the subsequent mobilization of resources, it must be concluded that, following the initial inflow of external capital, a domestic capital-formation process takes place involving the absorption of quite considerable amounts of short-, medium- and long-term financial resources, some of which are provided by the surpluses of the other domestic sectors. In other words, a variable but undoubtedly significant portion of potential savings is attracted by the current and consumption financing of the external sector. Here again, the motor-vehicle industry is a typical case in point.

5. *Nature and functions of capital markets*

The foregoing should provide a more realistic view of the nature and functions of the capital market.

This mechanism is commonly taken as referring to the channelling of the budget surpluses of certain units into uses that entail expanding productive capacity or, alternatively, supplementing the real investment resources of units showing a deficit at least in the sense that their expansion programmes lack the necessary financial resources.

In practice, however, and in the light of the previous section, this is only one of the functions of the capital market and, under existing conditions, is probably not even the most important since greater significance now tends to attach the financing of current expenditure and consumer durables. Most developed economies have followed similar lines. A recent study on the subject, for example, concludes that "even though financial markets in industrial countries are highly developed . . . much financing of investment does not, in any case, take place through the financial institutions that constitute the market in an ordinary sense".[72]

The situation in those economies, however, is not at all the same. One difference is the size of the main units of economic organization; although they operate in a very large general framework in the developing countries also, they rarely find their counterpart in domestic enterprises. Another is the prevalence of conglomerates, which involves all sorts of different enterprises in the financial mechanism and transcends all the conventional categories of monopolies and oligopolies. The third difference has to do with State subsidies or transfers to private consortia so as to open up new possibilities of technological innovation.[73]

The situation is quite different, for example, in Latin America. There, the biggest enterprises, when private, are still relatively small;

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[71] As regards this point, but with reference to the preliminary stages, reference is often made to the monetization of the system as traditional activities are progressively incorporated into the market.

[72] See *World Economic Survey* 1960 (United Nations publication, Sales No.: 61.II.C.1), chap. 1, p. 51.

[73] See Jean-Jacques Servan-Schreiber, *Le Défi Américain* (Paris, Editions Denoël, 1967).

when they are foreign-owned, they are bound by the over-all strategy of the parent company. Though conglomerates are now beginning to make their appearance, they still do not play any significant role, even when under national control. Finally, for various reasons, State and public enterprises do not have the same room for manoeuvre for financing major private or public projects as in the developed countries, either.

These circumstances tend to give the capital market in developing countries a special slant and to accentuate its importance as a means of channelling surpluses into capital formation. Nonetheless, because this function does not seem to be properly fulfilled, the most common and direct way of turning savings into investment is still through the public agencies that handle the State's general resources or credits. As will emerge in section III, there are a number of exceptions, the most outstanding of which is perhaps the saving and loan financing system for construction purposes.

It is not the intention of this study to establish a clear-cut distinction between resources or savings used for promoting real increases in productive capacity and those that are used to further its utilization. On the other hand, though there are fundamental relationships between these two levels, it would be rather naive not to distinguish between them at all, especially in view of the particular situations of economies at various stages of development. In developed economies, the increase in productive capacity is something that ensues almost automatically from the maintenance of suitable conditions of demand and financial complementarity. For developing economies, the main question is one of supply; namely, that the expansion and diversification of the productive structure should pave the way towards higher incomes and increased demand.

6. *The structure of savings*

There is an even greater shortage of information on savings in Latin America than on investment. Nevertheless, it is possible on the basis of partial data to form a sufficiently clear idea of its structure to be able to compare it with that of certain developed economies.

Table 12 shows the situation of three groups of countries selected earlier in some recent year as regards private and public, national and external participation in the formation of gross domestic savings.

It is immediately apparent that, with the exception of Ecuador, the private sector's share (comprising the savings of households and enterprises) is considerably higher. It is however important to note that, in many cases, there is no breakdown of the contribution of public and semi-autonomous enterprises, which are included in the private sector (only Argentina, Mexico and El Salvador provide data on the savings of public enterprises). On the other hand, though the relevant information is fragmentary and only covers Colombia, Chile and Costa Rica, it confirms the impression that it is the enterprises, with their depreciation funds and undistributed profits, that provide the bulk of the savings of the private sector. An unusual situation is that of Chile, which had a negative balance under personal savings, not only for the year selected (1966) but for almost every year since estimates of its national accounts have been made.

The differences between the countries are even more pronounced from the point of view of the share of external saving in the total. In the group of relatively more developed countries, only Mexico shows a positive balance while that of both the others is negative. By contrast, in the third group external financing accounts for more than a third of total savings. Chile and Colombia fall somewhere between the two extremes and roughly reflect the overall figure for the Latin American economies during the period 1960-1965 (about 15 per cent).[74]

It may not be out of place here to recall that the greater the share of external savings, the smaller the domestic investment potential is likely to be. In the countries of the third group, the proportion of investment capital coming from abroad was also much larger.

The savings structure described above can now be compared with that of certain developed countries in recent years (see table 13).

The situation in Latin America is much the same except for the fact that household savings are somewhat greater in the developed economies.[75] On the other hand, in these economies, the share of financing from abroad is either a minus quantity or very small, which is hardly

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[74] See ECLA, *Economic Survey of Latin America, 1965* (United Nations publication, Sales No.: 67.II.G.1), table 5. Argentina, Brazil and Venezuela were included in these estimates, both because of their exceptional situation and because of their weight in the over-all picture.

[75] See *World Economic Survey*, 1960, op. cit., chap. 1, tables 1-3.

Table 12

LATIN AMERICA: STRUCTURE OF GROSS SAVINGS IN SELECTED GROUPS OF COUNTRIES

(Percentages)

Country[a]	Public			Private			National	External
	Total	Government	Government enterprises	Total	Household	Enterprises		
Group I								
Argentina	18.0	16.1	2.0	82.0			100.0	—6.5
Brazil		2.8		97.2[b]			100.0	—3.0
Mexico	28.4	18.8	9.6	71.6			100.0	11.7
Group II								
Chile		37.8	. . .	63.2	—11.6	73.8[c]	100.0	5.4
Colombia		24.0		76.0	6.8	69.2[c]	100.0	9.2
Peru	—	—	—	—	—	—	—	—
Group III								
Costa Rica	. . .	11.8		88.2	36.7	51.5[c]	100.0	34.9
Ecuador	47.4	. . .		52.6	. . .		100.0[d]	19.7
El Salvador ...	21.2	16.6	4.6	78.8			100.0	34.3

SOURCES: CIAP, domestic efforts and the needs for external financing for the development of Argentina (CIAP/232), Domestic efforts and the needs for external financing for the development of Mexico (CIAP/94), and Domestic efforts and the needs for external financing for the development of El Salvador (CIAP/183); for Brazil, Colombia, Chile, Costa Rica and Ecuador: ECLA, *Statistical Bulletin for Latin America*, Vol. V, No. 1, March 1968 (Special feature: National Accounts); for Peru, no data available.

[a] Argentina: thousands of millions of pesos at 1960 prices, year 1967; Brazil: millions of new cruzeiros at current prices, year 1964; Mexico and Colombia: millions of pesos at current prices, year 1965; Chile: millions of escudos at current prices, year 1966; Costa Rica: millions of colones at current prices, year 1964; El Salvador: millions of colones at current prices, year 1966; Ecuador: millions of sucres at current prices, year 1965.

[b] Public and private enterprises and household savings.

[c] Public and private enterprises.

[d] The breakdown of depreciation is as follows: 20 per cent for public and 80 per cent for private enterprises.

Table 13

SELECTED DEVELOPED COUNTRIES: SOURCES OF THE FINANCING FOR GROSS DOMESTIC CAPITAL FORMATION

(*Percentages*)

	Federal Republic of Germany	*Italy*	*Japan*
Government	25	15	20
Enterprises			
Depreciation funds	37	35–40	35
Undistributed profits	5	50	33
Households	33		

SOURCE: United Nations, *Yearbook of National Accounts Statistics.*

surprising as these are very often capital exporting countries.[76]

7. *Relationship between savings and investment, by sector*

From the origin or source of the savings, it is possible to gather some idea of the extent to which they are used to finance investment in each sector and, by and large, of the type of investment catered to in each case.

As regards the public sector, there is quite a wide gap between government saving and government capital expenditure in nearly all Latin American countries. At best—for example in Venezuela, Brazil, Colombia and Chile—the balance on current account is only enough to finance about 60 per cent of actual investment. Because of the deficit the public sector must find other sources of financing for its capital investment project. While in some countries, such as Argentina, Venezuela and Mexico, most of the deficit is covered by domestic credit, in others, like Peru, Chile and Ecuador, it is largely covered by external credits.[77]

This situation is highly significant, especially as regards public investment. Whereas the latter represented about one third of total fixed investment in Latin America between 1960 and 1965, in some countries, such as Chile, Brazil and Bolivia, the figure was much higher.[78]

Secondly, it should be borne in mind that, in all developing countries, financing the difference between public savings and capital expenditure poses a number of problems that industrialized countries do not as a rule come up against. In the developing countries, the State, for example, cannot really expect voluntary financial assistance from the private sector whose available surplus resources are usually either earmarked for or attracted to other investment. Furthermore, the possibilities of their drawing upon external resources or savings are dependent upon their balance-of-payments position.[79]

This being so, it is easy to understand why the gap between public savings and investment has often been filled by domestic credits that are in fact a means of obtaining compulsory transfers from other sectors without resorting to taxation. In some countries—such as Mexico, it would seem—the process does not appear to have caused much inflation since the expansion of the credit to meet the needs of the public sector was offset by controlling its monetary effects. In others, by contrast, this step has undoubtedly brought on the kind of inflation that goes with a compulsory savings transfer mechanism such as the one described, under which it is virtually impossible to calculate the compensatory effect produced by the reactions of the units involved, or to regulate it through price, credit and wage controls.

Finally, there is the composition of public investment. If, in the light of Latin American experience, one were to conceive of a division of labour between the public and the private sector, it would be seen that, broadly speaking, the State has been concerned with fairly clear-cut fields, such as public works (installations and basic services, buildings, roads, ports and drinking water supply), production of energy, major means of transport, social investment (especially education and health), strategic activities in which private participation national or foreign private investment has not been forthcoming or has been considered undesirable, and, lastly, various forms of investment in purchasing, subsidizing or participating in existing enterprises of different kinds.

Because of the very nature of public investment and because of the problems of a shortage of funds to finance it, this is one of the critical areas in the relationship between savings and investment. The subject was analysed in some detail in a recent survey,[80] which makes it quite clear, on the one hand, that in nearly all the countries considered there was an increase in the share of total government expenditure covered by current income during the period 1960-1966, which eased the pressure on the normal activity of the public sector. It also revealed that "it is universally apparent that the trends of public expenditure and public revenue are to some degree incompatible, that the former is usually the more dynamic of the two, and that the population as a whole, or influential groups of it, are more easily prevailed upon to maintain or expand government functions than to provide the necessary funds".

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[76] *Ibid.*, tables 1-2.

[77] ECLA, see *Economic Survey of Latin America, 1968* (United Nations publication, Sales No.: E.70.II.G.1).

[78] See ECLA, *Economic Survey of Latin America, 1965*, op. cit., table 4.

[79] *Ibid.*, pp. 91 *et seq.*

[80] See ECLA, *Economic Survey of Latin America, 1967* (United Nations publication, Sales No.: E.69.II.G.1), part one, chap. IV.

8. *Public financing problems*

One of the major obstacles to higher incomes, and hence to better public financing, is the relatively high level of public expenditure in some countries, particularly when at the same time the economic growth rate has been fairly low. Similarly, it is all the more difficult to increase the fraction of revenue set aside for financing public investment when current expenditure and transfer payments tend to increase comparatively more rapidly.[81]

Taxation also brings a number of difficulties. One of these is the problem of making indirect taxes—which still provide the bulk of tax revenue—sufficiently discriminatory; this is largely because it would have to be done at the expense of consumer durables, and these governments are very reluctant to do so because of its possible effects on what have become the most dynamic sectors.

In addition, there is the problem of extending and increasing personal income tax, which derives from the structural characteristics of developing countries and, to a lesser degree, from the relative inefficiency of the tax collection system.[82]

Another pertinent factor is the drying up or disappearance of certain sources of financing that used to be of considerable importance, such as direct or exchange taxes on the import-export sector and inflationary devices. In both cases, and especially where such sources were commonest accounted for the largest share, a point was reached where returns declined or the attendant disadvantages grew, so that much greater care had to be taken in using financing from these sources.

Again, the surpluses provided by the social security system also began to be exhausted as a means of financing public investment. The current tendency is clearly to use them for distribution rather than capital formation—largely because of the inflexibility of the latter in times of rising prices and a general extension of social security benefits.

Finally, the public sector faces several dilemmas in weighing up its tax requirements and other policy objectives. It must, for example, examine proposals and measures for promoting private saving and investment in the light of their repercussions on taxation, and decide whether to look for savings and investment resources among public enterprises or to adopt a price policy aimed at making basic goods and services cheaper or at curbing inflation.

9. *Savings of enterprises*

It has already been pointed out that the bulk of gross savings comes from enterprises. This obviously goes a long way towards financing the private sector's real investment, especially if it is taken as including the savings of partnerships (as well as corporations), for partnerships are undoubtedly a more important factor in developing than in developed countries. It is also obvious that the sector is responsible for the bulk of investment in the production of consumer goods and services (durable and non durable), which accounts for a fairly large portion of capital goods industries and export activities.

Though no relationship can be defined between the surplus on current account of the entrepreneurial sector and volume of its real investment, as was possible for the public sector, it may reasonably be assumed that not all of this surplus is devoted to fixed capital formation. In other words, there remains a balance which can be put to various uses, such as current financing, financing its intermediaries and consumers, or capital investment in other sectors (the public sector, for instance).

Owing to the lack of research on sources and uses of investment funds, a more realistic or detailed approach is impossible. Nonetheless, some idea of their nature can be gathered from various local surveys, such as a study carried out in Chile on relationships in the industrial sector from 1949 to 1960.[83]

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[81] Note, however, that education and health can have a very important place in current expenditure.

[82] This is precisely what has led some countries to concentrate on other direct instruments, such as taxes on net wealth—see *Economic Survey of Latin America*, 1967, op. cit.

[83] See Instituto de Organización y Administración (INSORA), *El financiamiento de la industria en Chile* (Universidad de Chile, 1962).

One of the points this study makes is that more than half (52.3 per cent) of the resources available for creating assets of various kinds were provided by domestic sources, i.e., undistributed profits and depreciation funds. As for the uses these resources were put to, it noted that only one quarter (24.2 per cent) was devoted to capital formation while the rest (about 72.9 per cent) was absorbed by other types of investment—either in real things (stocks of goods, for example) or in financial operations, such as the provision of credit and sales of securities (which account for nearly a third of all the use).

The comparison of these relationships with those existing at different times in two developed countries (the United States and France) and in India, two important deductions can be made: on the one hand, domestic sources account for a larger share of the total in those countries than in Chile (63 per cent in France and India, 58 per cent in the United States); on the other, fixed investment absorbs a far larger share of resources, i.e., roughly the same as domestic sources (65 per cent in France, 64 per cent in the United States, 62 per cent in India).

Of course it would be somewhat rash to base generalizations on the experience of a country like Chile, which in many important ways is unique. It must not be forgotten, for example, that any economy suffering from serious and persistent inflation is logically bound to need extra resources to finance stocks and provide operating capital in general, especially when the makers of monetary policy have to keep a watchful eye on the demand for current financing by economic bodies. A number of broad hypotheses can however be advanced regarding the savings-investment ratio at the level of the enterprise. One hypothesis is that the sector as a whole probably has more than enough capacity to finance its real investment. This, however, does not necessarily mean that the margin of surplus is sufficient to cover all the requirements or possibilities of fixed capital formation, since this side of the question is linked to other factors —such as the existence of profitable investment opportunities and the availability of the necessary external component.

Assuming that the sector shows an over-all surplus, it seems reasonable to suppose that an undetermined but strategically very important part of it would be diverted from fixed capital formation and channelled into current operational financing and—as mentioned above —the financing of consumption of durable goods, especially in countries where the large-enterprise sector is engaged essentially in this type of production.

10. *Personal saving*

Though individual and family saving does not seem to be so important in Latin America as in developed countries, this sector does—like the entrepreneurial sector—show a surplus of income over current expenditure.

Here, too, it is impossible to evaluate the relationship between this surplus and the formation of producers' capital. Some idea can, however, be gleaned from an examination of the use that is usually made of its ordinary surplus.

Contradictory though it may seem, one of the principal uses of household saving is apparently for the acquisition of consumer durables. While this is obviously not investment, in the strict sense, from the point of view of the nation's economy, it does tend to seem so to the individual concerned; and there is some justification to this, especially in the case of the more durable goods, since they represent not only an asset but also an inflow of invisible income which does in fact increase monetary income. This is yet another aspect of real income distribution, and the more such goods are concentrated in a few hands, the more important this aspect becomes.

The other main uses of personal saving, in the order of their apparent importance in Latin America, are as follows: (*a*) building, both for personal use and as a source of income; (*b*) financing of investment by individual entrepreneurs (though, strictly speaking, this should be considered as saving of enterprises); (*c*) transfer to other units (including financial intermediaries), either for purposes of capital formation or for the financing of current expenditure or consumption.

Thus, depending on the use or combination of uses selected, a larger or smaller part of the current surplus of personal income will be devoted to fixed capital formation and to various forms of financial investment, and this means that some of the questions that were discussed in the analysis of the situation in the entrepreneurial sector crop up here also, although with slightly different characteristics.

11. *Implications for economic policy and function of capital markets*

The foregoing remarks on the relations between savings and investment and the way they operate in the principal sectors help to clarify some of the fundamental problems involved in any policy designed to mobilize financial resources.

The first of these is quantitative and turns upon the need to increase the surpluses (or potential savings) of the various units and sectors so as to achieve simultaneously two major and related objectives: the financing of part of current expenditure and consumption (especially of durable goods) and the formation of fixed capital so as to make full use of the investment potential. Previous considerations on the savings potential suggest that there is a reasonable possibility of attaining this twofold target, but that the possibilities are not unlimited, and not only for economic reasons.

The other problems tend to be rather of a qualitative order. One of them arises from the advisability of distinguishing between the various targets so as to increase the share of resources that have a direct impact on the expansion of productive capacity, i.e., of narrowing the margin between potential saving and real saving as much as possible (i.e., real investment). Some of the obstacles and circumstances which prevent this have already been pointed out, but the objective remains of prime importance and can be achieved to some extent, but to what extent can be determined only in an actual case.

Another qualitative aspect concerns the need to transfer the surplus resources of certain units or sectors to others that are poorer but whose investment programmes may have high priority from the economic, social and political point of view, in the context of the development process.

Finally, it is important not to forget a requirement that has been mentioned several times, i.e., that of turning enough domestic saving into external saving to cover the cost of imports.

On the whole, Latin America has tried to deal with these problems, but many of the countries have not made any great effort or achieved any notable results.

The next part of this article contains a review and appraisal of some important national experiments, mainly designed to establish suitable conditions for increasing the surplus resources of the private sector and channelling them towards priority objective.[84]

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[84] See *Economic Survey of Latin America*, 1967, op. cit., part One, chap. IV.

III. LATIN AMERICAN EXPERIENCE IN THE MOBILIZATION OF PRIVATE SAVINGS

This part will discuss some of the major aspects of the mobilization of private savings (personal and company savings) in Latin America. The first section will describe the instruments and machinery currently being used to encourage personal savings and the second will cover measures to increase company savings and to encourage enterprises to channel their investment in particular directions. It will conclude with a consideration of some of the key features of financial intermediaries in Latin America and their relation to over-all economic policy.

1. *Ways and means of stimulating personal savings*

Ever since the 1940s, the Latin American economies have been experimenting with a number of mechanisms for mobilizing personal savings. Some were, or still are, an integral part of national economic policy; others have now reached the stage of diminishing returns or, if of relatively recent date, are currently generating savings at a high rate. Yet others, of no less importance, are no more effective or efficient than the traditional financial intermediaries. Added to this wide diversity of mechanisms are all the different conditions and circumstances under which they have operated and also the existence of other mechanisms in the region, all of which make up an extremely wide and varied range of incentives to save. These experiments can, however, be usefully examined in the light of the way in which they attract personal savings, since this was their basic purpose.

It is quite easy to pick out the main factors in the different mechanisms. The present analysis will be confined to experience in Latin America, and therefore a simple comparison of savings mechanisms provides a list of the factors considered most important or effective by their proposers. The order in which they are presented is in no sense an indication of their relative importance or effectiveness.

(a) *Degree of liquidity*

Experience in Latin America demonstrates quite clearly that one of the main conditions that individuals require from the financial intermediaries is the ability to be able to withdraw their savings in whole or in part without it being necessary to comply with legal or contractual waiting periods. This condition is virtually universal throughout the region since it occurs in all countries and covers a wide variety of financial operations ranging from savings deposits to fixed-income securities.

For example, in all countries of the region there is a legal notice period for the withdrawal of savings deposits which the intermediary may enforce at his discretion. If no notice is given, the amount of interest is reduced by sometimes as much as the annual total. As the financial sector has become more accessible and the number of savings accounts has increased, the amount of withdrawals before the stipulated date has also increased. During the 1950s, annual withdrawals in Peru represented 80 per cent of savings balances at the beginning of each year. During the first five years of the 1960s, this figure rose to 90 per cent, although there was a steady increase in the current and constant values of savings accounts.

Fixed-income securities can be classified by their degree of liquidity. In Chile, Central Bank bonds, known as readjustable savings certificates (*Certificados de Ahorro Reajustable*—CAR), yield a satisfactory rate of interest since they include revaluation of the principal on the basis of price increases plus an annual interest rate of 5 per cent. These certificates, which mature after four years, were initially redeemable on demand and at par value in any banking institution in the country. At the end of 1968, the Central Bank, apparently because it thought that new issues of CAR were not being taken up at a satisfactory rate, began to offer them at better terms, the net result of which was to increase their liquidity. Whereas redemption prior to completion of a twelve-month period formerly involved loss of the readjustment in respect of price increases, the CAR were now guaranteed to yield interest at a rate of 12 to 14 per cent, roughly equivalent to the probable monetary readjustment, after only ninety days.[85]

Another illustration of the influence of liquidity on personal savings is the case of Nacional Financiera S.A. in Mexico. Its financial certificates (*Certificados Financieros*) are contractually redeemable only upon ninety days' notice. Traditionally, however, Nacional Financiera repurchases them on demand at their par value, which is why a recent study on Mexico's capital market observes that the certificates can be compared with treasury bills in other countries or even with demand deposits. Nacional Financiera also issues fixed-term bonds (*Bonos Financieros*) which are taken up by individuals and to a lesser extent by enterprises. The same study ascribes the success of such bonds partly to the fact that those purchasing them are sure that, if necessary, Nacional Financiera will repurchase them on demand and at par value at any time.[86]

There are several reasons why individuals require virtually complete liquidity in financial instruments that are legally or contractually bound by notice periods. In some cases, it may be the result of lack of confidence in the financial intermediaries, as happened in Brazil in the early 1960s when a number of private deposit banks went bankrupt.

Furthermore, a proportion of personal savings may be just as seasonal as personal income, and not only in the rural population or the groups providing services for it since there are many Latin American countries where the wages of a large part of the working and middle classes comprise bonuses granted at certain periods of the year.[87] Time and savings deposit balances reach a peak, in addition to their long-term trend towards growth, during the last quarter of the year in countries with such different economies and institutional structures as Argentina, Brazil, Colombia, Ecuador and Peru.

(b) *Yield on savings*

Another factor of recognized importance in the mobilization of personal savings is the yield or rate of interest paid on deposits.

In this respect, experience in Latin America is very varied since in some cases a positive rate of interest has been accompanied by an increase in savings, while in other savings have increased even when the interest rate has been very low or even a negative value, as happened in Peru.

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[85] See Banco Central de Chile, *Boletín Mensual* (July 1968), p. 505.

[86] See IDB-CEMLA, *El mercado de capitales en México* (Mexico City, 1968), p. 73.

[87] See International Monetary Fund, *International Financial Statistics, Supplement to 1967/68 Issues.*

Peru's savings account balances increased more than five-fold in current values between 1955 and 1965. Deflated by the cost-of-living index, however, they increased by only 2.3 times, which means that their real value rose at an annual rate (8.7 per cent) higher than that of the gross product or domestic savings. The maximum interest paid on savings accounts was 7.2 per cent during the period, and this was applicable to only a very few accounts since it was payable only on accounts that had no withdrawals during each year. As in Peru withdrawals during the period 1955-1965 amounted to 90 per cent of balances at the beginning of each year, the main bulk of savers received a rate of interest very much lower than the maximum.

The proportion of withdrawals shows clearly that the majority of savers do not hold savings accounts because of the interest that they may yield. Furthermore, none of them, including those that save on a strictly annual basis, seems to have realized that in real terms they are not receiving interest since the cost-of-living index has risen at an average annual rate of 8.7 per cent, i.e., more rapidly than the maximum interest rate.

Similar situations have arisen in countries that have been or still are subject to inflationary pressures producing interest rates in real terms of zero or even a negative figure without affecting the volume of savings. In Colombia, for example, where the rate of inflation almost doubled between 1955-1960 and 1960-1963 (7.7 and 14 per cent respectively) without there being any change in the rate of interest on time deposits, the real value of such deposits continued to grow during the latter period, although at a slower pace.[88]

The possibility that the volume of personal financial savings will continue to increase in similar fashion has apparently been recognized and used by the authorities. There are various cases where nominal rates have been fixed that are equivalent for all intents and purposes to the probable rate of inflation, and others where rates have been fixed at a level appreciably below the probable rate of inflation. The former is the case of annual interest rates on personal time deposits in Brazil, which under lending legislation before 1966 had a ceiling of 14 per cent. In view of the fact that this figure had come to represent a very small proportion of the rate of inflation, in 1966 a monthly rate of 2 per cent was authorized, this rate being thought sufficient to correct the monetary distortions caused by inflation. This rate, however, did not produce the desired effect, since the general price level was rising by at least 25 per cent annually.[89]

(c) *Readjustment of savings*

Since price increases act as depressants on the yield of savings and involve an unfair loss for the person concerned (to the benefit of those receiving or using the resources), various methods have been suggested and applied to maintain the real value and yield of savings, the most common of which is the periodic readjustment of balances on the basis of an index reflecting price increases.

Brazil and Chile, both countries that have suffered relatively sharp inflationary pressures in the 1960s, are two outstanding examples of this. In Brazil, under an economic stabilization policy initiated in 1964-1965, the majority of personal savings arrangements were made eligible for readjustment, or "monetary correction" as it is also termed. In Chile, deposits in savings and loan associations for housing, savings deposits in the Banco del Estado, and the CAR certificates of the Central Bank referred to earlier, are also readjustable, and this seems to account in large measure for their rising popularity. Accounts in savings and loan associations, which began operations at the beginning of the 1960s, now total more than 250,000. Time deposits in the Banco del Estado, which showed a clearly downward trend up to 1964, recovered markedly when they were made readjustable in 1966. And roughly the same happened with the certificates of the Central Bank, especially when they were given greater liquidity, as noted above.

While systems of readjustment have applied chiefly to personal saving, they have also on occasion been applied to external credits and to credits extended to enterprises. In both these cases, however, the risks inherent in the system for the borrower have limited their use. In Chile, for example, at the request of debtors, the provision authorizing the Development Corporation to grant readjustable credits to enterprises was repealed by law. In Brazil, "monetary correction" was eliminated in the main instrument used by enterprises, namely bills of exchange, and an advance readjustment was established equivalent to the discount system.[90]

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[88] *Ibid.* The balances in lines A 25 and 45 were divided by the cost-of-living index (line 64) to obtain real values. The cost-of-living index rose at an annual average of 8.5 per cent during the period 1960-1966.

[89] ILPES, *Programación monetario-financiera a corto plazo* (Santiago, 1967), vol. II, p. 474.

Similarly, in some cases efforts to fix servicing for external credits in currency of constant international purchasing power have encountered a great deal of resistance. One example of this is the credit of 12.5 million dollars granted to Argentina by AID in 1962. Negotiations had to be broken off because at the time neither the Banco Central Hipotecario, which was to receive the credit, nor the Government, which was guaranteeing it, was prepared to cover the difference between the monetary repayments to be made at current values by borrowers and the repayments at constant prices demanded by AID.[91]

The reluctance of enterprises to accept readjustable domestic or external credit is easy to understand. Apart from losing the possible advantages of the low or negative rates of real interest they pay to the traditional financial sector, they would be faced with the complicated problem of establishing costs and sales prices on the basis of interest rates that they would only find out about after the event.

There have been similar problems with readjustable personal savings and credit. The readjustment of repayments must bear some relationship to increases in the real wages of borrowers; otherwise the burden of debt would be extremely heavy. But it is not easy to work out methods of readjustment that will in every case make guarantees to the creditor compatible with the repayment ability of the borrower. Even in Chile, where wage readjustments are always general and are established by law, the wage increase may be less or more than the increase in prices and any such difference will create difficulties for those who have to repay, for example, a loan which is readjustable on the basis of the rise in the cost of living. In view of this, other systems have been suggested that have other disadvantages, for example, repayments representing a fixed percentage of the borrower's income, which would be a *de facto* readjustment but would mean that the creditor would have no idea of what the amount of the repayment would be.

Apart from the influence of all the factors mentioned, the only possible explanation for the lack of relation between the real rate of interest and personal savings is that, irrespective of the pace of inflation, personal monetary savings decline least in value when held by the financial intermediaries. The intermediaries not only pay interest but also offer a service that certainly entails, at the lowest level of personal saving, a transfer of productivity.[92] Individuals lose these advantages when they hold savings themselves, for this does not stop the savings from declining in value. Hence, inflation may encourage people to acquire material possessions, but it does not absolutely deter them from having recourse to the financial intermediaries accessible to them.

(d) *Tied savings*

Tied savings, i.e., the savings made by people on the understanding that they will receive credit for a sum greater than their savings for the purchase of housing or durable goods, have proved to be the most effective stimulus to personal savings in Latin America. Although their effectiveness was well known, since some "capital formation companies" (*compañías de capitalización*) had used them earlier with satisfactory results, they were not used especially by Latin American financial intermediaries until the 1960s.

The lack of interest of intermediaries was to some extent due to the fact that the basic requirement for this kind of arrangement is the availability of non-personal capital to cover the difference between the amount saved and the credits granted to savers after they have fulfilled certain conditions. This difference is apparently quite large at the outset and, to judge from incomplete data, does not tend to shrink even though the number of persons using the system increases. Their lack of interest was stemmed therefore from the fact that they would have had to find some way of obtaining fresh resources or to modify the existing patterns for allocating their own resources in order to finance the initial dissaving.

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[90] ILPES, op. cit., p. 474.

[91] For obvious reasons, the cancellation of a credit agreement is not announced publicly. In this particular case, however, it may be useful to consult the following AID publications: *Loan terms, debt burden and development* (Washington, April 1965), p. C-1; and *Status of loan agreements* (Washington, June 1966), p. 3.

[92] It should be borne in mind that, particularly with respect to the commercial banks, savings arrangements or instruments are governed by general statutes that do not permit intermediaries to make provisos based on the level of personal income or savings. The intermediary may cease to use an existing arrangement, like a savings account, but if he uses it he cannot make any special distinctions. Consequently, he may be obliged, if it suits him, to use a special arrangement to transfer productivity to a certain segment of his clients.

In order to use this method of saving to good advantage, it has therefore proved necessary either to modify the operations of the existing financial sector or to create new types of intermediaries that can specialize in tied savings. The former has happened in only two countries—Argentina and Chile—since the majority of the other Latin American countries have given preference to the latter in the form of credit co-operatives known as savings and loan associations. It may be added that, in so far as they have satisfied the basic requirement mentioned above, results have been equally satisfactory in both cases.

Only one country—Chile—has established a system of tied savings linked directly to the purchase of durable goods. Savings deposits in the Banco del Estado[93] entitle the depositors to credit for purchasing a wide range of durable goods, notably consumer goods. Although the figures have been affected by the fact that deposits were made readjustable from 1966 onwards, balances have registered a considerable increase in real terms, rising from 159 million escudos in 1965 to 290 million in mid-1968.

Argentina is another case of modifications to the existing financial sector. At the end of the 1950s, public and private deposit banks were authorized to accept savings to secure credits in the future for housing. Although not completely financed out of non-personal resources, these deposits had a high annual growth rate in real terms (50 per cent) between 1960 and 1966. Total savings received by banking establishments grew comparatively much more slowly, at an annual rate of only 10 per cent.

In most of the countries of the region, preference has gone to the system of savings and loan associations or co-operatives. Owing to the savings and loan system, plus, in the case of Chile, the system of readjustment, the number of savers and the size of their balances have grown considerably. In 1967, there were over one million savers in Latin America, according to the Inter-American Savings and Loan Union.[94]

This growth is largely due to the fact that savings and loan associations have received non-personal capital either from abroad or from the governments concerned. In Chile, where funds come from both these sources, the number of savings accounts is over 250,000. In Peru, where non-personal capital comes only from abroad and in smaller volume than in Chile,[95] there were fewer than 200,000 savers at the end of 1967. In Venezuela, where external non-personal capital was not available initially, associations had to contend with the prospect of a contraction of operations in 1965. According to a study on the capital market in Venezuela, the depletion of domestic financial resources led to a serious crisis in the associations since the prospect that they would not grant new credits discouraged prospective members from joining and meant that some members lost any hope of securing a credit and withdrew, thus further aggravating the problem of the shortage of funds.[96]

What happened in Venezuela[97] clearly shows the importance of the basic requirement, i.e., the existence of non-personal capital, to enable associations to attract tied savings. It should be noted that the number of members of associations climbed rapidly from 38,000 in 1966 to 51,000 by the end of 1967 as a result of positive action by the Government to finance associations and a credit in dollars from AID payable over forty years.

The system of tied credit, although effective, has a serious drawback in that, before genuine personal saving comes into effect, mainly through repayments of the loans received, there is a period of personal dissaving. This may be due in part to the fact that, in its transfer from the United States to Latin America, the association system has become too specialized. Associations in the United States are simply credit co-operatives and as such loan funds to their members for a wide variety of purposes. This enables them to diversify their portfolio as regards maturity dates and enables them to receive untied savings from their members. In contrast, Latin American associations hand over long-term assets and, since they cannot compete with the commercial deposit banks in the financing of consumer durables or personal loans, they do not attract pure savings.

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[93] These deposits include time deposits proper and what the Banco del Estado calls demand deposits (*depósitos "a la vista"*).

[94] See Caja Central de Ahorros y Préstamos, *Informativo Estadístico* (Santiago, July 1968), p. 8.

[95] The authorized level for external credits to Chilean associations is ten times that of the Peruvian associations.

[96] See IDB/CEMLA *El mercado de capitales en Venezuela* (Mexico City, 1968), p. 73.

[97] The situation has been similar in other countries. In Mexico, for example, the number and size of savings and loan banks for family housing have declined. At the end of 1965 there were only three such banks with accumulated savings of less than 8 million dollars.

(e) *The system of mutual funds*

The most common form of saving, for example time deposits, does not fully meet the need for financial intermediaries of persons in the middle and upper segments of the income distribution, nor of those who have some knowledge of the comparative advantages of different forms of saving. Presumably, such persons endeavour to acquire shares or variable-income securities that protect the purchasing power of the principal against inflation or, if the economy has monetary stability, brings an appreciation in the principal related to the rate of economic growth. Although share quotations are falling in many Latin American countries, it should be noted that new share issues are generally purchased by those already holding shares in the enterprises floating the issue.

Mutual funds have been established in the industrialized countries, where enterprises also tend to be closed. These funds issue their own shares to the public and the resources obtained are invested in a wide variety of assets that can range from real estate that is rising in value to share capital in national or international enterprises. As the value of these assets increases, the profit is spread over the fund's shares, and the fund also pays out a part of the profits accruing from such assets in the form of dividends. Since the economies of the industrialized countries have grown steadily in recent years, shares in mutual funds have appreciated considerably, at least in monetary terms.

This apparent success has led international mutual funds to set up offices or subsidiaries in Latin America and, to a lesser extent, to the establishment of national mutual funds in some countries of the region. The results have varied a great deal depending on balance-of-payments situations and regulations governing payments on investment abroad, and on the availability of shares in the securities market. In Mexico, where the main bulk of transactions takes place outside the exchanges, mutual funds (investment companies) have done well in terms of investment in securities and in terms of share prices, and also, in at least one case, in the disposal of shares. According to data from the two major funds, investment in securities at market prices rose from 139 million pesos in 1960 to 338 million in September 1966, during which time the average value of a share rose from 120 to 176 pesos.[98]

Except in Mexico, private mutual funds have not been successful in attracting savings. In 1966, the funds that had been operating in Chile for an appreciable length of time accounted for a negligible proportion—2.2 per cent—of financial savings, and the volume of operations was in fact declining in real terms owing, *inter alia,* to the institution of readjustable savings.[99] In Colombia, mutual funds started up in 1959 and were very successful during the early 1960s, mainly thanks to the purchase of bills of exchange, a short-term financial instrument of high profitability. In December 1964, mutual fund assets totalled 211.9 million pesos, but failed to grow in 1965 when the Government decreed that funds could invest only in securities registered in national exchanges and in mortgage loans to real estate companies. In December 1967, their assets amounted to only 299.7 million pesos at current prices, or an increase in real terms of 5.2 per cent over 1964.[100] In both cases, this has been due not only to inflation but also to the small size of the capital market, because of the closed nature of most national enterprises.

In Peru, personal saving in mutual funds has apparently been high. Until recently, balance-of-payments regulations permitted investment in foreign securities, and this prompted foreign mutual funds to establish offices or subsidiaries in Peru. The results, as regards the amount of saving attracted, are not known, but the volume of operations increased the pressure on the balance of payments that began in 1967. This is clear from the fact that in mid-1968 the Peruvian Government enacted legislation specifically prohibiting Peruvian residents from investing in foreign mutual funds, and this measure indirectly affected the Peruvian subsidiaries. As regards the influence of the national capital market after this new legislation, it should be noted that according to an international capital association, Deltec Panamericana S.A., which has been operating in Latin American markets for some years, open investment companies are not feasible in Peru and it will be some time before the market is large enough to warrant their establishment.[101]

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[98] See *El mercado de capitales en México,* op. cit., table 7, p. 36.

[99] See Central Bank of Chile, op. cit., p. 581.

[100] See *Revista de la Superintendencia Bancaria de Colombia,* various issues.

[101] See IDB-CEMLA, *El mercado de capitales en el Perú* (Mexico City, 1968), p. 71.

The performance of private mutual funds can be contrasted with the dynamism of public mutual funds in Argentina. The Joint Institute for Securities Investment was established at the end of the 1940s, with the aim of attracting personal savings for investment in the share capital of enterprises whose shares were quoted on the national securities exchanges. Savings took the form of deposits up to a maximum figure receiving basic interest at a rate similar to that paid on savings accounts in deposit banks, plus an additional interest depending on the profits earned by the Institute through its exchange operations. The system was placed under the Banco Industrial in the mid-1950s with the financial intermediary having the highest coverage in the country—the National Post Office Savings Bank—subsequently joining it. The participation of the latter led to a considerable increase in deposits, and in 1966 the savings held by it and the Banco Industrial represented 37 per cent of all savings in banking institutions.

In other respects, too, the system has been very successful. The volume of savings rose in real terms from 2,000 million in 1960 to 12,700 million in 1965. Although this increase was comparatively less than the increase in deposits tied to housing, it represents a much higher growth rate than the average for domestic financial saving, which did not even double over the same period. The incentive used, apart from the accessibility of the Post Office Savings Bank, was always the two rates of interest, the basic rate and the supplementary rate payable on the profits obtained from buying and selling shares and their corresponding dividends.

The profits earned might well have been greater had there not been certain limitations on the purchase of shares of individual companies. Initially the Institute was not allowed to purchase more than 10 per cent of the total share capital of any enterprise. While this provision was eliminated from the status of the Banco Industrial during the 1950s the board decided to maintain a ceiling on holdings of 20 per cent. Although in many respects this ceiling was justified, it prevented the purchase of shares yielding good dividends or the purchase of larger quantities of shares likely to appreciate in value. Partly because of the decision, the operations of both the Banco Industrial and the Savings Banks helped more to strengthen the Argentine securities market than to promote real investment.

(f) *The coverage of the financial intermediaries*

Being able to make financial savings is dependent on the existence of financial intermediaries within the area in which economic activity takes place. In the case of personal saving, however, this alone is not enough since it is also necessary for the intermediaries to want to attract saving and to be free to do so. The intermediaries are not always interested in attracting savings because of factors relating to the probable profits they will earn and in many cases because their methods of operation correspond to patterns or legislation that restrict their activities with respect to persons.

What is needed, therefore, is for financial intermediaries to exist and for them to have genuine access to people. Although these two factors could be discussed separately, it is preferable to look at them together as a single problem: that of the coverage of the financial intermediaries. This is a justifiable approach because the importance of each of these factors varies considerably from country to country in Latin America, while at the same time the intervention of factors external to the financial sector is gradually eliminating their shortcomings. Looking at matters from the standpoint of past history in the industrialized countries, it can be seen that the most widespread shortcomings in the coverage of the financial intermediaries were due to the fact that, the larger the volume of their individual operations with persons, the smaller the profits of the intermediaries. The fact that intermediaries held back with regard to personal savings in the past does not mean that such savings were not potentially sizable. The result was that the industrialized countries established a number of public corporations to offer the possibility of saving both to people with relatively modest incomes and to communities which, although they had a sizable volume of savings, were not sufficiently compact to be attractive to the traditional financial intermediaries. There is no point in giving a list of these corporations, but it may be appropriate, in order to show the existence of the problem of coverage in an economy with a highly developed financial sector, to refer to the United States Postal Savings System. The number of offices handling savings accounts rose steadily after the system was initiated and in 1950 totalled 8,300, serving 3.8 million accounts. In the same year, there were 5,100 offices and agencies of the commercial banking system in the United States, while the number of savings and loan societies, which under United States banking legislation can be considered part of the commercial banking system, was 6,000.[102]

In the United States and other countries at a similar level of industrial development, the problem of the coverage of the financial intermediaries began to disappear around 1950. Technological innovations in bank accounting improved the ratio between profits and the size of individual accounts and enabled the commercial banks to reduce required minimum balances and the size of their offices. This improved the coverage of the deposit banks, as is clear from the fact that their agencies and branches increased very rapidly in number (totalling 17,800 in 1966), thus making the Postal Savings System unnecessary and eventually causing its dissolution.

In Latin America there was perhaps more need than in the industrialized countries for public financial institutions to make up for the scanty coverage of the private financial intermediaries, which had sprung up as a result of activities related to foreign trade known for their concentration in particular areas. Although the private intermediaries subsequently extended their services to include the manufacturing sector, they did not extend their coverage because manufacturing tended to be situated in the same areas as foreign trade activities. Around 1950, as a result, the majority of communities in the Latin American countries had no access to financial intermediaries and, except for some minority groups, had to hold their savings in the form of cash.

It was not solely the communities most distant from the financial centres that were adversely affected by the lack of financial intermediaries. Coverage was inadequate also in the centres, since banking offices were situated only in the financial and commercial area of the city and in the more wealthy residential districts. For the small-scale entrepreneur and those living in the urban fringe, saving involved a cost which made it less attractive. In addition to the cost of transport, there was also the time required for transactions which could be effected during only a few hours of each day and invariably during normal working hours.

The savings institutions financed by the public sector did not help to ease the problem. Most of them were established in the financial centres and when they opened branch offices, as for example the Savings Bank of Peru did, the offices were situated in areas already served by other financial intermediaries. The Savings Bank of Peru, whose branches spread no further than the metropolitan area of Lima, is a fair illustration of the coverage of such institutions in most Latin American countries. There are exceptions, however, one such being the National Postal Savings Bank of Argentina, whose services are available to most communities in Argentina through the postal system, thus providing an opportunity for financial saving to the less well-off sectors of the population. Another important example is the Agricultural, Industrial and Mining Credit Bank of Colombia, a development agency that acts as a deposit bank and has become the largest financial intermediary in Colombia. Since its establishment in 1932 it has actively pursued a policy of expansion as regards both the type of services offered and its coverage of the national territory. In both respects its influence has become considerable. As regards national coverage, in 1960 it had 430 offices, compared with a figure of 670 for all the other financial intermediaries operating in the country. And although it had comparatively fewer offices, it was more accessible, for it was the sole financial intermediary in half of the 430 municipal areas having financial services.

The accessibility of the financial sectors in Argentina and Colombia was exceptional in Latin America in the mid-1950s. Since then, however, the picture has changed as technological innovations in the operation and administration of the financial sector in the United States and other industrialized countries have gradually been disseminated. The possibility of reducing the size of bank offices and of holding small balances at a profit[103] enabled the deposit banks, especially the commercial banks, to increase the number of their offices and to be more accessible to the population at large.

This trend has become widespread in Latin America, although the figures are not all strictly comparable. Innovations were not introduced at the same time or—as might be expected because of differences in level of economic development and land area—with the same intensity in all countries. In Colombia, where regional balance had been promoted for some time by the geographical coverage of the financial sector, the number of branches of commercial banks rose from 572 to 1,086 between 1960 and 1967. The Agricultural, Industrial and Mining Credit Bank also continued to expand over the same period, when the number of its branches rose from 430 to 611. This expansion has helped to improve accessibility to the financial sector in Colombia even further, as is evidenced by the fact that the sector served 48 per cent of all municipal areas in 1960 and 68 per cent in 1967, a high figure for Latin America.[104]

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[102] See United States Department of Commerce, *Statistical Abstract, 1967*, p. 451.

[103] For example, the number of persons employed in the three main commercial banks in Peru remained virtually constant between 1950 and 1965, while the number of savings accounts rose from 600,000 to 1,218,000.

Similar trends can be observed in Brazil, whose economy has well-known regional imbalances. A study by the Latin American Institute for Economic and Social Planning[105] indicates that the number of banking institutions rose from 3,578 to 7,271 between 1955 and 1965. Although this number continued to rise in the economically most advanced regions, as has happened in other Latin American countries, the largest relative increases came in the less developed regions in the north. For example, the north-east region had only 6.3 per cent of banking establishments in 1955, excluding branches of the Banco do Brasil which had located 24.2 per cent of its offices in the region pursuant to the regional guidelines for national economic policy. Ten years later, the figures were 10.1 and 22.4 per cent respectively.

The case of Peru is probably a better illustration of the effect of making the financial sector more accessible to personal saving. From the 1950s onwards, the commercial banks took advantage of the benefits of technological innovation but came up against increasing restrictions on rediscounts from the Central Bank, which forced them to seek financial resources elsewhere, chiefly from personal savings. It should be noted that, since they could not legally offer higher interest rates, their only attraction was the accessibility of their offices.

In 1955, the deposit banking system comprised 284 establishments serving the metropolitan area and sixty-two areas in the rest of the country. Between 1955 and 1965, the number of establishments rose to 8,613 and that of areas served, excluding the metropolitan area, to 118.

Furthermore, the number of savings accounts increased over the same period from 830,000 to 2.1 million, in direct ratio to the number of banking establishments serving the public, as can be seen in table 14. This ratio also exists with respect to banks operating exclusively in the metropolitan area, the only exception being a bank that began operating in 1961.

The rapidity with which personal savings have reacted to improve access to deposit banks in Peru is also evident from two other indicators. The first is that accounts with a minimum balance (less than twelve dollars) account for three-quarters of all accounts opened in the period 1955-1965, and in 1965 they numbered almost a million more than in 1955. This is clear evidence that the more modest sectors of the population have increased their participation in savings transactions.

The second indicator is the fact that financial savings have increased at a slightly faster pace in the relatively less developed regions of the country than in the metropolitan area or the coastal exporting area. In the Andean area, total savings account balances rose by 5.6 times in the period 1955-1965, despite a very low per capita income and a very low economic growth rate. In the Amazon area, the figure is 6.5 times, although in this case a rapid rate of economic growth has apparently

Table 14

PERU: NUMBER OF ESTABLISHMENTS AND SAVINGS ACCOUNTS IN THE COMMERCIAL BANKING SYSTEM, 1965

Organization	*Number of establishments*	*Number of savings accounts (thousands)*
A. *Banks operating throughout the country*		
Popular	140	424
Crédito	149	553
Internacional	89	241
Gibson	26	47
Lima	18	27
B. *Banks operating only in the Lima area*		
Continental	42	293
Wiese	28	113
Comercial	22	92
Progreso[a]	23	29
Unión	19	26

Source: Superintendencia de Bancos, *Memoria y estadística bancaria correspondiente al año 1965*, Lima, tables 1 and 28.

[a] Established in 1961.

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[104] See Superintendencia Bancaria, *Revista* (Bogotá, February 1968), p. 64.

[105] See ILPES, op. cit., p. 496.

compensated for the low level and unequal distribution of personal income. In the coastal area, where such fast-growth items as copper, fish-meal and iron are produced, the increase has been only 4.7 times. It would seem that these trends bear some relationship to the regional expansion of the banking system in Peru, since only twelve of the communities provided with financial services in the period 1955-1965 were in the coastal area, while the other fifty-four were in other regions, where the volume of financial savings increased more rapidly.

While these examples admittedly do not exactly parallel the situation in other countries of the region, they are basically typical. The amount of economically exploited territory may vary, as may the rate of economic growth, inflationary pressures and other factors. But the fact is that the number of banking establishments and the volume of personal financial savings have risen in all the countries of the region and that, in line with world trends, the need for hoarding wealth, or what amounts to the same, i.e., the deliberate or imposed retention of money by persons, is on the decline.

This process can be observed by comparing the amount of money outside the banking system with the amount of time deposits, as in table 15, which shows that the trend for the volume of time deposits to increase has been virtually universal, at least during the 1960s. Once it is realized that this trend occurs in a wide variety of countries, such as the United States, the Federal Republic of Germany, Pakistan, Bolivia, Mexico and Venezuela, it must be agreed that one of the factors behind it is increased access to the banking system in all these countries.

2. *Incentives to the accumulation and channelling of the savings of enterprises*

In reviewing the instruments and mechanisms designed to promote saving by enterprises, a distinction should be drawn between those used directly to encourage increased saving and those which are mainly intended to channel it in certain directions.

The incentives in the second group are not only more numerous but are used more frequently in the Latin American countries, since the incentives are related to policies designed to step up the rate of economic growth, correct sectoral or regional disparities, promote import substitution and/or increase exports. Although in most cases the purpose of these measures is to find new sources of saving, the incentives also affect saving in established concerns.

(a) *Direct incentives*

Saving by enterprises is not often stimulated by direct means in Latin America. Whenever this has been done through taxation, the incentives have not generally been applicable to the whole of this saving but only to one of its components: depreciation reserves or undistributed profits (this division disregards the fact that the line between depreciation and new or net investment is only theoretical.[106] In practice the demarcation line is somewhat vague, which makes it impossible to determine the magnitude of those components before and after the stimulus is applied).

In principle, depreciation is the wear and tear of equipment during the productive process and the sums paid into the reserve fund

Table 15

RATIO OF TIME DEPOSITS TO THE MONEY SUPPLY OUTSIDE THE BANKING SYSTEM

(Percentages)

	1961	*1964*	*1967*
Group I			
Australia	512	730	831
United States	264	343	419
France (savings only)	112	134	131
Italy (savings only)	231	243	278
Federal Republic of Germany	290	413	515
Japan	553	645	665
Group II			
India	57	53	65
Pakistan	30	50	80
United Arab Republic	34	43	45
Group III			
Argentina	63	83	95
Bolivia	2	5	14
Chile	118	110	117
Ecuador	44	48	64
Mexico	37	48	69
Nicaragua	23	43	95
Paraguay	23	64	115
Peru	117	140	130
Venezuela	122	179	185

SOURCE: International Monetary Fund, *International Financial Statistics.*

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[106] See National Bureau of Economic Research, *Capital in Manufacturing and Mining* (Princeton, 1960), pp. 130 *et. seq.*

under this head are the resources set aside annually to defray the replacement cost. Thus, net investment, in terms of saving, is equal to the financial resources spent on additions to such equipment. The distinction could not be simpler, clearer or more precise. In fact, however, external factors cause the actual reserves recorded to be larger or smaller than those which should have accumulated.

When there is a favourable difference, taking the wear of equipment as a basis, the surplus financial resources raise net investment or may be used for other purposes.

In Latin America's recent experience, however, the differences are more often unfavourable. Since the conservation of existing capital is a virtually inescapable requirement, entrepreneurs in several economies are compelled to divert for this purpose financial resources which have been expressly set aside for net investment.

This transfer of resources casts some doubt on whether or not direct incentives are effective in increasing depreciation reserves or undistributed profits. For example, the enterprise saving component concerned may increase sharply, but this could be the result of a simple internal transfer of resources rather than an actual rise in enterprise saving. Favourable differences may also be converted into profits that are distributed in disguised form, with the opposite to the desired result, to say nothing of the fiscal sacrifice involved in such a measure.

There would be no doubt about the effectiveness of these measures if action were taken to affect the two components of enterprise saving simultaneously, but this would entail a new definition of depreciation and profits from the tax standpoint, which would hardly be acceptable to enterprises or to the fiscal authorities in the region.

(i) *Allowances for depreciation.* In over-all terms, depreciation and gross investment rates in Latin America are much lower than in industrialized countries, mainly because of the differences in the levels of economic development; but this fact alone does not explain why depreciation rates in Latin American enterprises are barely half those usually found in the developed economies.

The reason would seem to lie essentially in the tax legislation. Depreciation allowances form part of the gross profits, but they are also a cost item for the enterprise. Consequently, their fluctuations affect the volume of profits liable to tax. Hence entrepreneurs are interested in pushing up the book value, of these allowances, while the tax agents' only desire is to establish a depreciation figure which on the one hand is fair and corresponds to the enterprise's real needs, and on the other hand can be determined objectively. Partly to fulfil this aim, Latin American tax legislation usually stipulates that the purchase value of the equipment, which is the only value that can be properly checked, should constitute the basis for calculating depreciation.

The system fails, however, if equipment prices rise rapidly and steadily. Replacement values may then exceed purchase values, which would be reflected in the annual depreciation allowances permitted under the tax system. This cleavage between book value and real value in Latin America has often meant that these allowances have been smaller than they should have been, and the deficit has been covered by transfers of profits to the depreciation account.

The use of resources which are entered as net investment of enterprises but which are actually used to compensate for inadequate depreciation allowances is not the only purpose of these transfers. It often happens in Latin America that certain industries keep in operation which, for technological reasons or according to the books, should be replaced. These are enterprises producing high returns, whose market is expanding slowly and is sometimes even contracting owing to competition from technologically more advanced substitutes. The most common are manufacturers of textiles from natural fibres, whose products not only have a stable market but can compete with synthetic substitutes.

In these industries, new equipment has a far larger unit production capacity than the equipment it replaces and it has the technological characteristics of the countries manufacturing it. In this connexion, it should be remembered that Western Europe's manufacturing production has grown almost exclusively on the basis of higher productivity and at accelerated rates during the past decade. Countries in this position are Austria, Denmark, the Federal Republic of Germany, France and the United Kingdom, whose sectoral employment indexes are practically stable despite production increases of 35 to 50 per cent.

Latin America's manufacturing production has not remained entirely static. Industrial employment series for Chile, Colombia and Guatemala have shown the same stability as those for the above-mentioned countries during the same decade, but this is not so in the case of production, which has expanded fairly rapidly. Inasmuch as there are several other Latin American countries in the same position, the problem of replacing equipment may perhaps be more important than is generally thought.

Many enterprises only replace equipment when market conditions are favourable. If the market shows no firm prospects of expansion, entrepreneurs may prefer to keep their old equipment, particularly if they are able to transfer the difference between the allowances and actual depreciation to the expansion of production capacity in new lines or to the internal distribution of profits among shareholders and directors.[107]

Some enterprises set part of their real depreciation against net investment; others, whose depreciation allowances are too large, allocate them to investment or the distribution of profits. Incentives to increase depreciation allowances should merely correct the distortion brought about by inflation.

(ii) *Revaluation of fixed assets.* In Latin America, however, corrective mechanisms consist mainly in the authorization to revalue fixed assets,[108] which benefits all enterprises that do not form part of export enclaves.[109] As was to be expected, such authorization varies from country to country as regards legal procedures, regularity and types of indicator of the monetary devaluation of fixed assets.

In Brazil, for example, enterprises can revalue their fixed assets and also consolidate their reserves in capital account within a period of up to 120 days from the end of their financial year. This system permits constant revaluation, but since most financial years end in June, this is the decisive month for evaluating the importance of the Brazilian machinery. Thus, for want of data on the use of funds, the total increases in the capital of enterprises officially registered in the country in June 1968 show that 44.3 per cent originated from the revaluation of fixed assets and 24.5 per cent from the incorporation of reserves. Only 14.5 per cent of the value of these increases represented cash sales.[110]

The Chilean tax system also permits the periodic revaluation of fixed assets. In this case, too, there is a lack of detailed enough information on sources and uses of funds to evaluate the extent to which such revaluation affects the depreciation rate. The investigation carried out jointly by the Central Bank of Chile and the Planning Office[111] does not make it possible to distinguish between natural and juridical persons under private law in so far as internal sources and revaluation are concerned. Nevertheless, it is interesting to note that in 1964 the resources under the head of revaluation equalled 45.2 per cent of those drawn from the other sources.

In the two cases cited above, as also Argentina, Colombia and Peru (where fixed assets are not revalued regularly), it is impossible to say whether the results are anything but a rough approximation to the system of calculating fixed assets on the basis of their real replacement cost. It remains a matter for conjecture whether or not they have led to increases in enterprise saving, or whether the resources which were formerly used for this purpose but were computed as net profits or sources of new investment are now being more correctly designated as depreciation allowances; or, lastly, whether there has merely been a reduction in the taxable portion of the profits and an increase in the non-taxable portion.

(b) *Accelerated depreciation*

While the mechanisms described above are intended to bring the funds set aside for reserves into line with real depreciation by writing off part of the value of worn equipment, accelerated depreciation involves a change in depreciation rates or in the evaluation of the useful life of the equipment, so that the allowances will be higher than the cost of wear and tear. The incentive offered to owners of enterprises is that they can recover their capital earlier than usual.

This system has been used in the industrialized countries when steps were being taken to promote the expansion of plants which might become technologically obsolescent or redundant within an unforeseeable but fairly near future. Although used mainly in times of war, when the aim was to encourage production that would necessarily disappear at the close of hostilities, it has also been used in peace time for specific purposes such as private investment associated with United States space programmes. As a rule, however, the governments of industrialized countries have rejected entrepreneurs' requests for its application on the ground that it significantly reduces tax revenue.

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[107] In countries where labour legislation permits, or it is not too costly, there is another possibility: to renew equipment and reduce manpower.

[108] See OAS/IDB/ECLA Joint Tax Programme, *Problems of Tax Administration in Latin America* (Baltimore, Johns Hopkins Press, 1965), p. 475.

[109] These enclaves usually keep their profit and loss accounts in dollars.

[110] See Getulio Vargas Foundation, *Cojuntura Economica* (August 1968), p. 28.

[111] Relates to a study of sources and use of funds, *Estudio de fuentes y usos de fondos, Chile, 1960-1964*, but the financial sources are clearly specified.

Accelerated depreciation has been applied on very few occasions in Latin America. The modifications introduced into the methods of calculating depreciation by some Laws, however, tend to create an equivalent promotion mechanism. It is a striking fact, for example, that some export sectors, particularly those comprising enclaves of enterprises which exploit non-renewable resources, operate on the basis of special legislation. In this case, depreciation rates are not ruled by the systems used in the rest of the economy, and are apparently based on a useful life estimated for tax purposes which is less than the real figure. This, together with other factors, accounts for the fact that over-all depreciation rates in Chile, Peru and Venezuela are in the neighbourhood of those obtaining in industrialized countries.

The best known case of the application of incentives through deliberate use of the accelerated depreciation formula in Latin America is that of Brazil's motor-vehicle industry. The law promoting the establishment of motor-vehicle plants during the 1950s authorized them to write off larger amounts for depreciation for a period of ten years.

Fairly recently a well-known United States automobile manufacturing company had to revise its plans for initiating a new production line in Brazil because the Brazilian Government refused to authorize accelerated depreciation to the plant that was to be constructed, as the period covered by the above-mentioned law had expired.

(c) *Tax incentives for channelling investment*

The evaluation of Latin America's experience in the application of incentives that operate directly in channelling investment, such as tax credits exemptions, is hampered by the fact that these incentives are rarely applied separately from other mechanisms, with which they form a general system of incentives.

Tax credits, i.e., refunds of taxes already paid, has been found by a noted economist[112] to be more effective than tax exemptions, which are tantamount to the temporary remission of taxes that are due. His argument is based on the fact that, although tax exemption does stimulate investment over a pre-determined period, the operations thus encouraged may well yield no profits, in which case the incentive will cease to operate. Its effectiveness therefore depends on the extent to which entrepreneurs can forecast the likelihood of obtaining profits as a result of tax exemption.

Tax credit, on the other hand, is not related to a profit which may or may not be obtained in the future. Inasmuch as it consists in refunding taxes already paid, it represents a definite and immediate increase in the assets of the enterprise and helps to swell the amount to be reinvested. The capital to be provided by the enterprise is less than the value of the assets it acquires, which can raise its profits to relatively high levels or reduce its losses.

From this point of view, tax credit is much more useful than tax exemption. Nevertheless in Colombia, for example, very few enterprises have taken advantage of tax credits for the expansion of installed capacity since 1965.[113]

Under certain conditions, tax exemption is the only mechanism that is really applicable. In this category are projects for encouraging investment in backward or border regions where there are no entrepreneurs to take advantage of tax credit, since exemption is a means of seeking new capital and not only of ploughing back profits in existing enterprises.

Tax credit can be used, however—as is borne out by two cases in Latin America—to encourage enterprises to invest in activities outside their usual line of business in particular regions. In Colombia, for example, tax credit has been accorded since 1960 for investment aimed at achieving greater industrial diversification and fuller utilization of surplus capacity in steel production. Under this form of credit, firms may retain the sums they would have paid in tax on their earnings if they have made new investments which will help to develop basic industries, import substitution or the consumption of domestic steel. As regards the first objective, Colombian entrepreneurs had already embarked on diversifying their production; therefore, tax credit has spurred on a process which was already under way. For instance, one of the main textile companies has invested heavily in the production of African palm oil, a product for which there is not only a considerable domestic demand but a good external market. The same company later invested in other production lines unrelated to textiles, and more recently it obtained the patents to begin manufacturing motor vehicles. The results have not been so satisfactory in regard to steel consumption, since there always is some idle capacity in the steel plant.

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[112] See Albert O. Hirschman, "Industrial development in Brazil's Northeast and the tax credit franchise of Article 34/18", *Journal of Development Studies*, July 1967.

[113] See IDM/CEMLA, *El mercado de capitales en Colombia* (Mexico City, 1968), p. 82.

The second experience in Latin America is in the North-east region of Brazil whose backwardness has been a constant source of concern to Brazil's economic policy-makers over the past decade. One of the biggest obstacles to stabilizing regional imbalances is the difficulty of transferring private saving from the more advanced to the more backward areas, which is the reverse of the process that usually takes place. A mechanism has been operating in Brazil with the purpose of transferring enterprise savings from the South Central to the North-east region; these represent tax credit under *article 34/18,* so called because of the numbers of the articles in the 1961 and 1963 acts which established it. In accordance with these provisions, juridical entities in the South Central region may deposit half the amount of their tax for earnings in the Banco del Nordeste del Brasil. This deposit reverts to the treasury after three years if it has not been used to purchase shares or other liabilities in juridical entities in the North-east which are initiating or expanding development projects approved by the Department for the Development of the North-east (SUDENE), the planning agency for that region. These projects are also accorded for bank credit in an amount of up to 50 per cent of their value and other tax and customs advantages which form a powerful system of incentives. The main requirement for private investors is that they must provide between 12.5 and 25 per cent of the financing needed for the project out of their own pockets, the percentages varying according to the priority assigned to it by SUDENE.

The opportunity cost for holders of deposits is nil, a fact which has prompted many southern enterprises to establish subsidiary plants in the North-east. It has also led to the appearance in this region of a great many promoters who actively seek association with holders of deposits with a view to obtaining from them as much as possible of the additional financing required for a project.

The South Central enterprises not only transfer financial resources to the North-east; they also make available to the enterprises they have set up or helped to finance in that region technical and administrative advisory assistance, their knowledge of the domestic market and their contacts with foreign suppliers of equipment, which may be decisive factors for the future success of North-east enterprises established under the incentive of article 34/18.

This system has not been in force long enough (first deposits were made in 1962) to compile investment figures properly. Apart from the delay involved in negotiating projects for approval by a public agency, the time normally taken to execute industrial projects must also be taken into account. For these reasons, the amount actually drawn against the deposits is still a small proportion of their total value or of the amount allocated to approved projects. The latter amount rose from 171 million new cruzeiros in 1963 to just under 680 million in 1967, which means a flow of new private investment to the North-east of 35 and 136 million respectively.

This movement could not have taken place except at the expense of the Brazilian Federal Treasury, but it must be remembered that the same applies to other stimuli composing the system of incentives for the North-east. These had already begun to show favourable results before the application of article 34/18, but the article itself completed the system of incentives and accelerated the favourable effects on the region's development.

This article has also been the butt of certain criticisms, the two main points being that: (*a*) in extending to foreign firms the facilities accorded under article 34/18, the public sector and the Banco do Nordeste are actually financing approximately 75 per cent of their investment in the North-east, either in plant of their own or in the form of capital contributions, all of which will in time result in an outflow of capital out of all proportion to the amount they invest; and (*b*) in permitting the installation of plants and subsidiaries owned entirely by South Central enterprises, one of the factors which have in the past accounted for the comparative backwardness of the North-east—outflow of capital to the South Central region—will in all probability be accentuated.

(d) *Export promotion provisions*

In addition to the incentives for channelling saving and investment to backward areas, an increasing number of mechanisms for promoting exports of manufactures are operating not only in the economies possessing an established production inventory but also in those which are trying to break down the limitations imposed by the small size of the domestic market by exporting to other Latin American countries and the rest of the world.

In the past, attempts were made to promote only traditional exports through tax credit, currency devaluation, and sometimes the cancellation of debts to development banks.

In the industrialized economies, export incentives have naturally been applied to manufactures which play a key role in the development already started. For example, in several Western European countries and in Canada and Japan, such exports account for 20 per cent of the over-all supply of the manufactures concerned.[114] This proportion explains the desire to establish as comprehensive and effective a system of promotion as possible, which usually includes guarantees against non-payment of debts, development credit up to 90 per cent of the value of exports, short- or medium-term bank credit on which the interest has been reduced by means of public subsidy, tax exemptions and credit, and other subsidies that are not always specifically stated.

In contrast, the mechanisms that are gradually being established in Latin America are almost entirely tax exemptions. Some development banks, such as the Banco de Comercio Exterior de México and the Banco Industrial del Perú, have launched an active credit policy for the promotion of exports of manufactures. The banking system has played no part in this, however, although some of its main promotion instruments, such as selective rediscount rates, form an integral part of its statutory powers for stimulating certain production sectors, including that of traditional exports. Except in the case of the two above-mentioned institutions, apparently the only promotion credit of importance is that accorded on the basis of the revolving fund established in several countries by IDB to promote exports of capital goods.

These could, however, be considered temporary limitations. The trend towards doing more to promote exports of manufactures is evident from the mechanisms examined below; but the fact that they are being modified and expanded is an indication that this is only an incipient trend, which will continue until such time as a system of incentives is established along the same lines as in the industrialized economies.

(i) *The drawback system.* Drawback is the refunding of customs duties paid on imports of goods which have been incorporated in a product which is subsequently exported. It can of course be a total or partial refund and it can take the form of exemption from or remitting or refunding of the duties concerned. Total exemption is not, however, the maximum benefit which can be accorded to the exporter. It can be supplemented, without risk of violating international agreements such as those concluded by GATT or ALALC, by exemption from or the refunding of shipping and customs clearance charges and indirect taxes.

The drawback clause can have many different implications, which increase with the differences in customs procedures. Consequently, its inclusion in a law or regulation is not a proper indication of the value it actually possesses as an export promotion mechanism. In practice, it can be a meaningless provision or a highly effective mechanism, according to how it is introduced or used. Emphasis is placed on this point for two reasons. First, because in order to judge each particular use of the drawback it would be necessary to go into details not only of a legal nature but also of customs procedure, which would require a more extensive study than the present one. Secondly because, although the clause was adopted several decades ago in customs legislation or Latin American trade treaties, it was subject to conditions which made it ineffective as a general export incentive. The present trend in customs legislation and procedure is to make the drawback more effective.

In Brazil, for example, drawback legislation was established by decree in 1934; it authorized Brazilian customs authorities to refund the duties paid on imports of raw materials used in the manufacture of products "capable of competing on the world market". A 1957 act made several formal amendments to this decree, and also modified it in substance by eliminating the above phrase, whose bureaucratic slant was intended to safeguard the Brazilian Treasury from the possibility of any abuses in the application of this incentive. It was not until 1961 that the remaining restriction was eliminated by decree, which made it applicable to any export items at a more advanced stage of processing than raw materials. Under the 1964 decree, which is still in force, the drawback has been extended to cover containers or packing materials, and imported articles used in the production of export goods in Brazil, which is evidence of the economic policy aim of continuing to encourage Brazil's manufacturing sector to compete on world markets.[115] Although the evolution of this mechanism can be followed in the legislation applying to it, it has been put into operation too recently for any evaluation of its results yet to be possible. All that can be said for the moment is that some enterprises which have taken advantage of the drawback are exporting refrigerator compressors, motor vehicles and electronic components.

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[114] See Paul S. Armington, *The geographic pattern of trade and the effect of price changes*, Washington, 31 October 1968, p. 5 (an internal document of the International Monetary Fund).

Peru is an illustration of the opposite case, i.e., of the drawback becoming a promotion mechanism without the necessity of modifying its legal basis. The system has been operating in Peru as long as in Brazil. Until recently it benefited traditional export activities, particularly through the duty-free entry of sacks. From the 1940s onwards it was made use of by the incipient fishing industry, with exemptions from duties on hermetic containers, cartons, printed labels, and chemical agents contained in export products. Without substantial modification, it has recently been extended to cover the commercial motor-vehicle assembly industry which has been exporting to neighbouring countries.

Peru's case also reveals some possible disadvantages of the drawback. Peru has land that is suitable for the cultivation of jute, the main raw material used in the manufacture of sacks. This land lies in one of the more backward parts of the country which the Government is seeking to develop but which, being a tropical area, requires the support of the domestic market for those production lines which might eventually be launched on the world market. Without wishing to enter into the controversy that has arisen on this subject, it may be noted simply that the export sectors which benefited from the application of the drawback to jute sacks opposed the granting of tax exemptions and other incentives to agriculture and the Peruvian jute industry.

This may, at the moment, be an exceptional case; but inasmuch as the drawback is accorded both for items not produced in a country which can be incorporated in other goods, and for locally produced articles, though at a comparatively high cost, it is not unlikely that there will be other cases like that of the jute sacks. This could perhaps be avoided by the prior stipulation of deadlines that could be extended as appropriate. Such a measure has not been necessary in the industrialized countries, but it may well be advisable to adopt it in Latin America to avoid conflict between the policy of stepping up exports and that of diversifying the manufacturing inventory.

(ii) *Exemption from indirect taxes.* International foreign trade agreements do not bar exemptions from or refunds of indirect taxes on exports, and they even permit their use to supplement the drawback. This system has been little used in Latin America, which is understandable because indirect taxes constitute the main and sometimes an increasing source of fiscal revenue. On account of this fact, together with the public sector's efforts to increase investment, such exemptions or refunds have been dispensed with. In some countries, such as Peru and Chile, the drawback system is used to promote exports, but they are not exempt from multiple-stage indirect taxes.

Even in countries where tax exemption is used to promote particular exports, the exemption is only partial. It applies to the indirect taxes payable on the export item, but not to those previously paid on purchases of the raw material or semi-processed components used for its manufacture. Since most indirect taxation in Latin America is multiple-stage in type, the exemptions granted do not prevent the exporter's price from being pushed up by the indirect taxes paid by domestic producers and distributors.

Another noteworthy fact is the assumption that the rates of indirect taxes in Latin America are relatively low. It is impossible to establish an average for the region, but the great majority of these rates seem to lie between 3 and 10 per cent.

If these rates alone are compared with those of other countries, this assumption is probably correct. Norway, which is endeavouring to bring its rates into line with those prevailing in Western Europe, has abandoned the 12 per cent rate for indirect taxes and adopted a higher one, by which means it expects to obtain an increase of 5 to 8 per cent in the prices paid by consumers.[116]

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[115] See Getulio Vargas Foundation, *Cojuntura Economica* (September 1968), pp. 73 *et seq.*

[116] See *Frankfurter Allgemeine Zeitung*, 13 January 1969.

The point is, however, whether or not rates of 3 to 10 per cent are to be considered high if the aim is to promote non-traditional exports. The measures adopted by the Federal Republic of Germany at the end of 1968 as part of the international monetary stabilization system agreed on by the central banks of the principal market economies may be recalled in this respect. At that time, West Germany established the equivalent of an indirect tax of 4 per cent on exports and reduced import duties by the same amount. The purpose of this measure was to encourage a contraction of exports and an expansion of imports.

Without ignoring the existence of other obstacles to trade flows of manufactures from developing countries to industrialized market economies, the comparison between Latin American rates and the taxes established by West Germany shows that the former are high in so far as competition in that market is concerned.

The solution to the problem, which involves raising f.o.b. prices by the amount of the indirect taxes, is not so simple. It entails the replacement of the present system of successive taxes on sales by their collection at a single point in the transaction, for example from the wholesaler. Such concentration usually results in considerable tax evasion. The value-added system may be preferable; the tax is distributed among the different products and intermediaries and has no snowballing effect, since it is applicable only to the value added at each stage of production and distribution. This brief description is enough to make it clear that the introduction of this method would involve a series of complicated changes in the tax system.[117]

Up to the end of 1968, this system had been used only by a few industrialized market economy countries or by some of their state governments. At that time, however, the Government of Mexico passed an act replacing the existing Mexican system of indirect sales taxes by the value-added system. Mexico is the first Latin American country to adopt such a measure and it is too early to predict its results.

3. *Characteristic and problems of the mobilization of financial resources in Latin America*

Although, given the variety of national experiences, it would be difficult to make any observations that would be valid for the whole region over the past few years, it will nonetheless be quite useful to explore some of the characteristics and problems that seem to be representative of the whole situation.

In the first place, there is the relationship between the system of financial intermediaries and the authorities and economic policy directives.

Examples of economic policy-making authorities exercising effective control over the financial sector in Latin America are few and far between. This situation is not peculiar to the region, however, or even to areas at similar stages of development since it also frequently occurs in industrialized market economies. To cite only one case, the controversy that has raged between the United States Federal Reserve System and the Federal Government as to the advisability of applying economic measures to ease inflation or accelerate the country's growth rate is well known.[118]

In this and other cases, lack of co-ordination tends to be the outcome and that virtually leaves them free to act independently of economic policy directives, including those formulated by the monetary authorities. The Latin American country with the greatest degree of independence in this sense is probably Panama in whose institutional set-up there is no central bank and none of the various other banking authorities that Latin American economies usually possess. It is undeniable, of course, that this situation has turned the country into a financial centre which big commercial banks use to conduct their international operations. On the other hand, however, it does seem to have deprived the Planning Office, which the Panamian Government was at such pains to set up, of a particularly valuable instrument for carrying out its task.

Owing no doubt to the increasing responsibilities that the public sector has had to assume during the 1960s in Latin America, a tendency has evolved to bring the financial sector more in line with economic policy objectives. In Colombia, the Banking Authority and the Central Bank have been guided, since 1963 by the directives of the Monetary Board, which is empowered to study and adopt monetary and credit measures and to exercise related functions. It is interesting to note that only one of the Board's Directors, the Manager of the Central Bank, comes from the banking sector. The other three members are two ministers and one senior official from the Planning Office.

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[117] For a detailed description, see European Economic Community, Report of the Commission Concerning the Form and the Method of Application of the Common System of Taxation on Value Added, document IV/Comm. (64).

[118] In a speech to the Banking Association of the State of New York on 20 January 1969, Mr. A. Hayes, President of the New York Federal Reserve Bank, pointed out that the system was not independent *of* but independent *within* the Government.

More recently, Peru passed laws reforming the country's financial sector in a variety of ways. One of these reforms is directly relevant to the subject under discussion, since it concerns the transfer of certain controls from the Central Bank to the Banking Authority, both of which are now to be part of the Ministry of Economy, and the constitution of a "selective credit" system restricting the power formerly possessed by the commercial deposit banks to use their resources as they pleased.

This is not the place to examine the Colombian and Peruvian systems in detail. Enough has already been said to suggest the existence of a trend towards co-ordinating the operations of the financial sector with economic policy.

Apart from Cuba, Mexico is the country where this trend has reached its maximum expression in Latin America. A series of studies have been written on the Mexican financial sector which, taken together, provide a picture of strict control by the Ministry of Finance, whose national banking and securities commissions operate in conjunction with the Banco de México S.A. in regulating both the monetary and the capital market. From the point of view of the main financial intermediaries, the Banco de México possesses the necessary machinery for this co-ordination. According to a recent study[119] the machinery employed by the Central Bank was as simple as it was effective and consisted of establishing a high level of compulsory reserves on new deposits (for the most part equal to 100 per cent) which could be waived if the banks concerned were prepared to invest their new deposit in loans and investment plans that were in line with a specific quota scheme laid down by the Bank of Mexico, and the priorities laid down by that Bank for the use of the deposits in the banks and subsequently in financial associations. In this way, the Central Bank (or Banco de México) can control the credit granted by the financial sector by the choice not only of the type of intermediary but even, where necessary, of the individual entrepreneur.

This machinery also enables the Bank to bring about changes in the borrowing policy of the intermediaries, as can be seen from the directives it issued to private financial associations in 1966 to the effect that they should endeavour to obtain long-term loans instead of the short-term loans that they had been operating with up to then. They were allowed to issue two to five year bonds, in the expectation that the development of these associations which buy bonds and shares and keep part of their portfolio invested in shares, would eventually depend on the issue of even longer-time securities.[120]

Clearly then, the control system of the Banco de México provides a means of stimulating the development of financial intermediaries that are prepared to bide by the long-term guidelines of the country's economic policy. At the same time, it means that intermediaries that do not fulfil these requirements are still able to operate, while preventing internal factors from enabling them to expanding a manner that would be detrimental to that policy.

The question of the linking or financial intermediaries with or integrating them in the general economic policy and development programmes has of course been raised on the assumption that the policy or programmes really do establish guidelines, objectives or a frame of reference with respect to savings and investment transactions. If there is no such framework or certain policy objectives conflict with each other, the financial system is bound to suffer. For example, if the expected expansion of the productive system depends on an extension of the consumer durables market, it is not surprising that the surplus savings are diverted towards financing this demand, with a consequent reduction in the potential savings available for other purposes.

(a) *Characteristics of the financial intermediaries*

In the light of the foregoing and of the second part of this article the financial intermediaries can be divided into two major groups: the traditional kind of agency, and those that can be described as "developmental intermediaries".

There is in fact no clear-cut distinction between one type and the other; it would be wrong, for instance, to imagine that this means they are divided into public and private institutions, for both exist in each category. They differ rather in their respective attitudes to new activities that have not yet been able to establish their credit-worthiness and the traditional and profit-earning sector.

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[119] See BID-CEMLA, *El mercado de capitales en México* (Mexico City, 1968), p. 52.

[120] See *El mercado de capitales en México*, op. cit., p. 28.

(i) *Traditional intermediaries.* Traditional intermediaries serve as catalysts for economic development. Their activity corresponds, on the one hand, to a demand for services coming mainly from individuals and, on the other, to a demand for financial resources coming from clients (enterprises, government, individuals) whose operations and solvency are well established. They contribute towards economic growth by channelling financial resources from sectors showing a surplus to those showing a deficit. Since both forms of demand reflect the over-all growth of the economy, they should theoretically reach a state of equilibrium in the long term.

In the short term, however, it often does not work out like that. As has already been pointed out, technological progress has somewhat stepped up the effective demand for financial services, with the result that resources held by financial intermediaries have tended to exceed the effective demand of the users wherever inflationary pressures have not distorted it. Greater liquidity, which means the underutilization of capacity and higher costs, has not encouraged this category of financial intermediaries to finance activities which, though potentially dynamic, have not been established very long and therefore represent a greater risk than usual. Several of the intermediaries in this category have preferred to use their liquid assets for financing the consumption of luxury articles,[121] the purchase of mortgage bonds, and, to the extent permitted by law, the acquisition of shares in existing enterprises or the discounting of short-term bills. Apart from the first and last, which bear higher interest rates, these operations are merely ways of keeping capital employed at a sufficiently high yield to offset the payments made by the financial intermediaries themselves. It should not be forgotten, for example, that Colombia's five investment funds came up against countless difficulties when the new legislation introduced in 1965 barred them from operating with bills of exchange—short-term bills yielding 3 per cent a month interest which, as also occurred in Brazil, may help to maintain inflation through their impact on costs and prices.

They lose their equilibrium also in respect of the demand for financial resources when a non-financial sector enters a period of rapid growth. When this happens, the additions to the productive equipment cannot normally be financed entirely by the savings of the enterprise itself, and the resulting deficit has to be covered by credits or other external resources. In most Latin American countries, the financial sector could support a dynamic sector by making use of rediscount facilities until such time as demand for its services and demand for its resources are once more in balance. If rediscount facilities are limited or non-existent, the chances that the traditional financial intermediaries will modify the pattern of allocating resources to established clients and finance the demand of a dynamic sector seem to be very slim.

There seems to have been such a lack of flexibility in Peru, for example, where the pattern of investment by the commercial banks changed very little between 1955 and 1965 although the new fishing industry was growing rapidly. In both the first and the last year of this decade, 25.3 per cent of their investment was in manufacturing industry (not including fishing enterprises); for the same two years 36.5 and 37 per cent of their funds were devoted to the discounting of bills connected with sales of merchandise. The same unchanging pattern was to be seen in the figures under most of the other headings in the country's banking statistics.[122] As to the fishing industry, these statistics show that in 1965 it absorbed a total of 76 million soles in investment by the commercial banks, a paltry sum compared with the exports of fisheries products which amounted to 5,008 million soles for the same year.[123]

This merely shows that this category of intermediaries did not respond to situations that subsequently proved to be highly beneficial for the economy and for the potential growth of the traditional intermediaries. It would be wrong, however, to assume that the fault lies with the type of intermediary. There is the case of Japan, for example, where the same kind of financial intermediary has been making a positive contribution to the growth and diversification of the country's entrepreneurial sector for nearly twenty years now. It is more a question of a general attitude to development which is sometimes shared by the entire financial sector. This attitude, for instance, affects development banks—especially the agricultural banks, which are inclined to allocate the bulk of their resources to the modern parts of the agricultural sector, and within these areas, to the biggest farmers. Moreover, development banks are not as a rule authorized to receive personal deposits or, if they are—as in the previously mentioned case of the "special deposits" in the Industrial Bank of Argentina—they cannot use them for development purposes so effectively as they should owing to legal restrictions or the restrictions imposed by their boards of directors.

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[121] This does not include durable goods; various services, such as tourism abroad, are also financed in this way.

[122] See report of the Superintendencia de Bancos, op. cit., p. 290.

[123] See Banco Central de Reserva del Perú, *Boletín* (Lima, September 1967), p. 51.

(ii) *Developmental intermediaries.* In respect of developmental intermediaries there are many encouraging signs of change in Latin America. There is a steady increase in the number of countries where financial intermediaries that make their resources available for the introduction of new activities or the growth of other activities that will help to diversify the economy are beginning to make their presence felt.

In the early 1950s, there were only three Latin American institutions which could have been said to belong to this category: the Caja de Crédito Agrario, Minero e Industrial (Colombia), the Nacional Financiera S.A. (Mexico), and the Corporación de Fomento de la Producción (Chile).[124] Today the list would be much longer and would include both new government agencies and those development banks which have changed their policy are now in this category. As to private financial enterprises, the list would be very short and include only those that promote private investment in certain Latin American countries with the help of international financial resources.

As regards intermediaries coming under public law, reference must once again be made to the Nacional Financiera S.A. of Mexico.

Apart from its close connexions with the economic policy authorities and its extensive powers, the most original feature of this institution is that it has access to, and operates with, all kinds of individuals and entities whose surplus savings it channels into priority areas of investment in the public and private sectors. In nearly all other cases, resources are in one way or another limited to the public sector. The Nacional Financiera, on the other hand, can tap all the potential sources of savings.

As regards private intermediaries providing investment resources, the only ones worth mentioning are the development financing corporations operating in Colombia, although there are certainly some in other Latin American countries also. The principal sources of funds of the private corporations in Colombia are Colombian shareholders and banks—which in one case put up two thirds of the capital—the Corporación Financiera Internacional and foreign investors. Private financial institutions can moreover issue bonds and accept deposits, and they may borrow from the Central Bank up to an amount equal to 100 per cent of their capital and from the Fondo de Inversiones Privadas, which receives the counterpart funds deriving from United States Government loans to the Colombian Government.[125] These institutions not only represent one of the main sources of financing for the Colombian manufacturing sector but have also contributed towards the association of foreign companies with local firms in setting up major enterprises in the fields of petrochemicals, fertilizers, food packaging and synthetic fibres,[126] and in other fields of considerable importance for the country's economic development.

(b) *Internal organization of the system of financial intermediaries*

In addition to revealing that a large part of its resources is channelled into uses other than the expansion of productive capacity in the strict sense, the system of financial intermediaries that has been evolving in Latin America would also appear to be suffering from an obvious lack of internal organization. This is not surprising, considering the speed with which the various agencies have sprung up and, above all, the somewhat mechanical way in which instruments and procedures more suited to developed economies have been introduced without allowance being made for the new environment. The main result has been to bring about an excessive and costly form of competition in which numerous agencies seem to be fighting over a relatively small amount of potential savings.

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[124] In Chile, CORFO acts as an intermediary between the Government, the Central Bank and foreign financial intermediaries and Chilean non-financial sectors.

[125] See *El Mercado de capitales de Colombia*, op. cit., p. 49.

[126] *Ibid.*, p. 52.

Thus, for example, the Central Bank of Chile began issuing adjustable savings certificates in 1966, at exactly the same time as the adjustment of time deposits in the Banco del Estado was authorized. Though the incentives provided by these measures were quite different in character, it is none the less a fact that, once the portion that went into adjustable savings in credit associations had been deducted, the flow of personal savings that they tried to tap was not *large enough* to allow both mechanisms to operate simultaneously.

In 1966, Argentina introduced a system of mortgage saving. Notwithstanding its highly satisfactory results, it brought about a fall in the savings—personal savings—invested with the two official mutual funds operated by the Industrial Bank and the Post Office Savings Bank, which used them for purchasing securities on the Argentine stock exchanges. In other words, the only result was that resources were transferred from one kind of intermediary to another.

Colombia, Mexico, among other countries, have authorized private financial institutions to accept time deposits. In Mexico, this has enabled these institutions to support investment by providing capital for the financing of the corresponding enterprises on a longer-term basis than was possible for the commercial banks. The same is not true of Colombia where, as was mentioned in connexion with the 1965 law modifying discount operations, the financial institutions have been competing with the commercial banks.

On the other hand, it often happens that new intermediaries replace, or are added to, existing ones.

A case in point is that of Latin American countries that possess specialized sectoral development banks financing both large and small enterprises but where financial agencies operating with private capital are also to be found. If public resources deriving from rediscount operations, counterpart funds and foreign loans that add to the public debt are assigned to the latter, they are obviously being treated as development banks in open competition with the existing ones. However unlikely this may appear, such a situation does actually exist in two Latin American economies where public funds have been used as a basis for the establishment of such financial agencies or have helped them attain a turnover that they would probably not have achieved had they had to rely solely on private savings.

Another example of duplication of intermediaries that deserves attention because of the social cost involved is that of savings and loans associations in countries that already possess government mortgage banks. Except for those whose capital has been cut to a minimum by inflation, these institutions have operated satisfactorily enough within the financial limits imposed by the size of the capital market concerned. They would have operated on a larger scale if they had been allowed to tap personal savings from outside the capital market, and on an even larger scale if they had been authorized to accept savings tied to housing credits. It might also be pointed out that owing to their public character these institutions were not purely profit-making enterprises.

The mortgage banks could have played the same role as was later assigned to savings and loan associations for housing construction. This is proved by the case of Argentina where these associations made no headway until 1965, when they received support from public funds and that of Peru, where the decision to bring the interest rates paid by the mortgage bank into line with those of the deposit banks enabled the mortgage bank, as from 1965, to tap a greater annual volume of savings on the capital market than the associations could, notwithstanding the fact that both the mortgage bank and the deposit banks paid lower rates of interest than the associations.

Another anomaly in the mobilization of savings in Latin America is the tendency to import only certain elements of financial intermediaries that have demonstrated their efficiency in industrialized countries. This is no mere matter of structural adjustment to adapt these intermediaries to the situation in Latin America without reducing their efficiency, but a real impairment of their efficiency, so as to obviate the necessity for making changes in the institutional make-up of the financial sector or the capital formation of enterprises.

Argentina's system of public mutual funds corresponds to the second type of adjustment. Patterned originally on the Istituto Mobiliare Italiano (IMI), the number of shares they could purchase in any enterprise was restricted to 10 per cent of the capital of the enterprise, a percentage that the directors raised several years later to a self-imposed maximum of 20 per cent. Unlike the case of IMI, which can support the launching of new enterprises and enables the competent agencies of the Italian Government to exercise their rights as shareholders, the bulk of the resources tapped in Argentina merely made for more activity on the stock exchange.

The savings and loan associations throw light on another situation. In industrialized countries they are not specialized intermediaries but rather one of the many intermediaries which compete with one another to attract personal savings. As they are co-operative societies, they receive deposits from and grant loans only to their members. They may, however, invest in a wide range of securities on the capital market and also make loans for any purpose. This means that they can put their surplus liquid assets profitably to work and receive only pure savings from their members.

In the form in which they have been introduced into Latin America, they have undergone changes which vary from country to country in degree but all severely restrict their freedom to use their surplus liquid assets and make them so specialized that they are unable to attract pure savings at all easily. The disadvantages attendant upon this kind of adjustment were already apparent long before the associations actually had any substantial amount of surplus liquid assets.

The above considerations not only shed some light on certain aspects of financial intermediaries in Latin America but also serve to compare the situation and experience relating to them with the objectives of and position with regard to the mobilization of potential savings discussed in part II. On this point, it may safely be said that the financial intermediaries or agencies of the capital market have expanded and diversified considerably and have reached hitherto untapped sources of savings. On the other hand, there is no doubt that the instruments and channels for channelling these resources towards an expansion of productive capacity and particularly towards priority development targets are still rather makeshift. From this angle, it is easy to understand the importance of the points that have been raised, namely the need to fit financial operation into the framework of economic policy and to adjust them to policy decisions, the need to encourage and favour developmental intermediaries, and the need to make the system of intermediaries more efficient by improving the division of labour between them and making them better adapted to their task.

EARTHQUAKE IN PERU

The ECLA secretariat considers that it may be of interest to publish in this issue of the Bulletin *the report and recommendations of the ECLA/ILPES Mission on the earthquake in Peru of 31 May 1970. The report was presented at the sixth extraordinary session of the Committee of the Whole, which adopted the two resolutions here reproduced.*

The session was held at United Nations Headquarters on 22 and 23 June 1970 to consider the situation that had arisen in Peru as a result of the earthquake, which caused widespread devastation.

It was the Government of Chile which proposed that the session should be convened for this purpose.

REPORT AND RECOMMENDATIONS OF THE ECLA/ILPES MISSION ON THE EARTHQUAKE IN PERU OF 31 MAY 1970

1. *General description of the catastrophe*

At 3.23 in the afternoon of Sunday 31 May, Peru suffered a violent seismic disturbance which was felt by the inhabitants of a vast area stretching from the Amazon port of Iquitos in the north to the coastal region some two hundred kilometres south of Lima. Hours later the country and the world learned that an earthquake of major intensity and magnitude, with its epicentre on the continental platform about 80 km from the coast, between Chimbote and Casma, had severely affected the Department of Ancash and brought extensive destruction to the Departments of La Libertad in the north, Huanuco in the east, and part of Lima in the south, extending over an estimated total area of 83,500 km^2.

Although at the time of preparing this document the ECLA-ILPES Mission has not had access to a scientific report on the earthquake, it can be confirmed that the most severely damaged area is one of Peru's most active seismic zones, the Huaylas valley, which, together with the Arequipa valley, is one of those where earthquake intensity is greatest. The nature of the destruction observed by members of the Mission both in Chimbote and in the Huaylas valley, suggests that the intensity of the earthquake was probably between VI and VII on the corrected Mercalli scale, while the damage caused in certain very restricted areas would indicate an even greater intensity, due partly to the faulty construction or foundations of the buildings affected. An intensity of this degree would correspond to an approximate magnitude of between 6 and 7 on the Richter scale.[1]

The destruction wrought by the earthquake, which for the reasons given and because of the design and the type of materials employed caused heavy damage to dwellings and other buildings, was greatest in the mountain areas on account of localised landslides, rockfalls and avalanches which prevented the water from draining away. Above all, an immense *huayco* (avalanche) which occurred when a gigantic cornice of ice broke away from the north side of the peak of the Huascarán mountain and descended the Llangunaco ravine, burying the village of Ranrahirca—recently rebuilt following a similar avalanche in 1962—and the large town of Yungay—with an estimated population of 18,850—under a mass of mud, ice, water and rubble. To appreciate the magnitude of this catastrophe, it should be borne in mind that the cornice of ice which broke away was situated at roughly 2,500 metres above the town and at a horizontal distance of 10 km up the ravine, which meets the Santa river at a right angle. The Santa valley is at present full of debris brought down by the avalanche which, judging by eye from the air, would appear to cover an area of at least 10 to 12 km^2, to an average depth of around 3 to 5 metres. (The depth was estimated both from the channel cut by the river itself through the material deposited by the avalanche and from the trees and other signs.) The amount of mud deposited on the buried villages and in the ravine itself would suggest that the mass that swept down it in a matter of minutes must have been between 100 and 150 million m^3 in volume. It probably built up in the narrow neck of the ravine to form great waves which flooded or "jumped" over the hill running parallel to the ravine, which, rising to some 200 metres, appeared to protect the town of Yungay on the south from any accident of this nature.

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[1] The "magnitude" of an earthquake is independent of the epicentre or location of the seismographic station and is determined by recording instruments. "Intensity" is based on the reactions of people and the behaviour of buildings and natural objects in a given locality.

The Mission hopes it will be excused for putting forward its own appraisal of the situation while valuable scientific studies conducted by Peruvian and foreign agencies which will provide useful background data are still in progress.

The water of the Santa river rose as a result of the avalanche, producing a huge wave fifteen metres high which swept through the narrow Cañón Del Pato causing considerable damage to the Huallanca-Chimbote railway line. Several sections of the railway were buried in mud and in many parts the very foundations of the track were virtually torn out of the ground.

The seismic activity in the area has continued with tremors of varying intensity set off by the earthquake, which are undoubtedly still producing side effects such as landslides and earth-falls. Fortunately, the phenomenon was not accompanied by a tidal wave or by *tsunamis* and the Mission was informed that so far no unheavals, cave-ins or settling had been observed which might indicate changes in the local topography other than the landslides and avalanches already reported and possibly the emptying of some lakes.

2. *Economic and social conditions in the region affected by the earthquake*

In order to assess the general effects of the earthquake on Peru's economy and social development, it is imperative to have some knowledge, even if only superficial, of what the Departments concerned represent in relation to the whole country. Unfortunately, the available macroeconomic data are not sufficiently up to date and detailed for it to be possible to achieve this objective completely.

In spite of this serious difficulty, and even at the risk of committing some errors, the Mission will try in this section to present an over-all view of this kind.

It shows that Ancash and La Libertad are very important to the economy, and that until the sources of production in the area are re-established the Peruvian economy will sustain very substantial losses which may slow down the present trend towards a more accelerated economic growth rate.

(a) *General considerations*

The usual difficulties in making an economic and social appraisal of the results of a disaster such as that which took place in Peru are aggravated by the fact that the earthquake area has been only partially surveyed, and that the 83,600 square kilometres it covers present a wide variety of economic patterns. It comprises one of the main grain-producing regions in the country; a region where a spontaneous process of land settlement has been going on since the last census, in 1961, with the migration of a large number of inhabitants from surrounding areas; two cities where industrial development has been extraordinarily rapid in the last few years; and the coastal region, where export agriculture is based on a substantial increase in irrigation with groundwater. Another obstacle to any economic appraisal of this kind is the fact that the macroeconomic and sectoral statistics always appear with some delay.

In terms of territory, the earthquake has seriously affected the economy of the Department of Ancash, the provinces of Santiago de Chuco, Huamacucho and Otuzco in the Department of La Libertad, and all the Andean provinces in the Department of Huanuco. In the provinces north of Lima, which, like those mentioned above, are adjacent to the Department of Ancash, there was damage to some villages and in their communications.

The main material damage sustained is described in another section of this report. From the economic standpoint, one of the problems it has caused is the paralysation of all services in the Andean areas. This is a serious obstacle to a return to normal economic conditions and is causing the sudden migration of the most productive section of the population to areas such as Lima, where it will probably increase the proportion of disguised unemployment. This is already apparent in the sharp increase in the population of the town of Chimbote which, according to reports from the emergency committee in the area, has occurred since the earthquake.

As regards the national economy, the economic depression caused by the earthquake, even if only to start with, in the disaster area will necessarily result in a decline in real demand for manufactured products. It must be borne in mind that most of the inhabitants of those regions formed part of Peru's monetary economy. Therefore, in spite of the relatively low level of personal income, their demand for finished products was significant since it was mainly for industrial products which have long exhausted the possibilities of import substitution. This economic setback will become less important and may even be offset by reconstructions and allied activities.

The Peruvian Government has of course adopted emergency measures, followed by other measures for the economic rehabilitation of the area. It is thus forced to divert material and financial resources that were intended for the economic development and stabilization programme which it had successfully launched in late 1969. One of the most important aims of that programme was to eliminate as far as possible the open and disguised unemployment prevailing in most of Peru.

(b) *The economy of the Department of Ancash*

The available economic indicators show that, over the past ten years, the economy of the Department of Ancash has expanded more rapidly than that of any other department in Peru. This is due to the steady growth of the traditional sectors, such as agriculture and services, and to the establishment of new industries in the Chimbote area.

Chimbote is the nucleus of the recent industrial expansion in this region. Industrial activity is based on the boom in fish processing and the steady expansion of steel making. The fishing industry in Ancash contributes more than 30 per cent of Peru's total fish meal production and is therefore an important source of foreign exchange.

The steel industry is giving rise to allied industries, such as the manufacture of metal, refractory and chemical products. Thus a new industrial centre whose population appears to have grown at an annual rate of 13 per cent in the last ten years is coming into being on the Peruvian coast.

There is no up-to-date information available on the regional distribution of income in Peru. In 1961 it was estimated that Ancash accounted for about 9 per cent of the total domestic product. Judging from the above-mentioned trends, the proportion must have risen to about 14 per cent by the end of the 1960s. Moreover, with the amounts that had been or were to be invested in the Chimbote area and in industry in the sierra region, this Department's contribution to the national economy would no doubt have continued to increase in the future.

For a better understanding of the Department's economy and a proper assessment of the effects of the earthquake, it is necessary to distinguish between the two regions composing it. The Cordillera Negra constitutes a natural barrier between the coastal valleys and the Andean area. The latter comprises the Callejón de Huaylas and the eastern slopes of the Cordillera Blanca which drop down to one of the main tributaries of the Amazon. The coastal region, 11,000 km^2 in area, is approximately two and a half times larger than the sierra. The coastal region has a population of 310,000 and the sierra of 435,000. The two areas are briefly described below.

(*i*) *The economy of the coastal region of Ancash.* The coastal region of Ancash, like that of the rest of Peru, is a desert strip crossed by a few valleys, through which flow the tiny rivers rising in the nearby Cordillera Negra, and the Santa River, which is fed by the waters of the Callejón de Huaylas and flows into the sea near Chimbote. The highest part of this dry area is 1,500 metres, at which level rainfall is more abundant and therefore there is more vegetation and crops are grown.

The most important town in the Department of Chimbote lies north of this coastal strip, about 400 kilometres from Lima, with which it is linked by the Pan American Highway; the whole of the section of the Highway which runs along the coast of Ancash is paved. Chimbote has a population of about 212,000 (28 per cent of the total for the Department), and it is the main centre of Peru's fishing and steel industries. As a result of its rapid growth there are extensive shanty towns.

Owing to the aridity of this region, agriculture is confined to the river basins and can be extended only by means of irrigation, but this is limited in any case by the heavy investment required and the small amount of arable land available.

While the Ancash coastal area represents 8 per cent of the whole coastal area of Peru, only 6 per cent of the total cultivable coastal area lies within it, representing just 18 per cent of the whole area of the Department. This region therefore has a lower agricultural potential, even though intensive agriculture is practised there, with a proper use of fertilizers, and the yields are consequently high.

The principal crops, apart from subsistence crops, are sugar-cane (41 million soles in 1967), groundnuts and cotton. There is some stock farming and crop farming, but on a smaller scale than in the sierra.

Chimbote is the most important fishing port in the world; 28 per cent of the fish caught in Peruvian waters is unloaded here. Forty per cent of Peru's total production of anchoveta, the chief species, comes from Chimbote. The entire tuna catch passes through this port.

Recently, there were forty-seven fish processing plants operating in the Department of Ancash, representing 30.5 per cent of all Peru's fish processing facilities. The fishing fleet consisted of 400 vessels and employed 4,300 fishermen. Fishing activities in this area provide employment for about 7,600 persons, the difference between this and the previous figure representing the workers in industrial plants. Thirty-seven per cent of Peru's total output of fish meal and 50 per cent of its fish oil are produced in Ancash.

Most of the plants are in Chimbote, although there are some in Casma and Huarmey. A sample of the plants indicates average fixed assets of about one million dollars per plant.

Previously, the steel industry used Tysland-Hole electric furnaces for reducing the ore, but these have now been replaced by a blast furnace fired with imported coke.

Total steel making capacity is about 350,000 tons of ingots a year, but the actual output of steel and pig iron is less than 90,000 and 120,000 tons, respectively. This is partly due to the temporary problem of an imbalance between steel making capacity and that of the plants producing semi-finished and finished products.

The bulk of the production is non-flat products, but a rolling mill with an annual capacity of 130,000 tons of flat products is being installed.

The following figures provide a yardstick for estimating the loss of production due to forced idleness as a result of the earthquake: the daily output of the forty-five registered steel plants employing more than ten workers amounts to 10.4 million soles, or 270,000 dollars.

Steel making provides employment for about 1,600 persons. Allied activities include the manufacture of refractory products and chemicals.

Other important activities in this area include repairs to boats and motor vehicles.

Although the manufacturing industry (establishments with five or more workers) of Ancash provided employment for some 8,000 persons, it is estimated that in 1966 about 21,000 workers were employed in industry in the Department if artisan-type activities are included.

Ancash is an area where both industry and population have grown at a rapid pace, and a high proportion of the goods it produces are sent elsewhere; its own consumer market and labour force are in full development. Given the conditions under which such expansion is taking place in Peru's coastal region and its great momentum, this partly explains the flimsiness of many dwellings in the coastal area and the inadequacy of the urban infrastructure and other public services.

(*ii*) *The economy of the Ancash sierra.* Owing to the difficulty of obtaining regional data, it is impossible to give anything more than a very rough description of the economy of the Ancash sierra and its importance in the economy of Peru. A further obstacle to an objective analysis is the apparent universal tendency to treat the area as if it did not differ basically from other parts of the Peruvian Andes, despite its tremendous advantages in having fairly easy access to coastal markets and in a combination of a favourable climate with a relatively abundant supply of land, and rivers which never run dry, providing enough water all the year round. The Ancash sierra also benefits from the presence of numerous smallholders who, although their individual incomes are low, produce marketable surpluses.

This goes to explain both why there are a great many small villages and towns and why this is a monetary economy and the barter system prevalent throughout most of the Peruvian Andes is uncommon. The presence of these villages and towns is in turn responsible for a network of services, which means that the proportion of the active population engaged in trade in the Ancash sierra provinces is far larger than the average for the Peruvian Andes and that, from the point of view of services, it is comparable to the northern coastal provinces of Peru, except for the oil-producing areas.

Consequently, the farmers possess a local market to which they send whatever part of their produce they have been unable to dispose of in the coastal markets because of distance and competition from other areas. The result of this has been a high degree of diversification in agricultural production, despite the fact that the ecology of the region is relatively uniform. They have thus been able to avoid the kind of single-crop agriculture to be found in other parts of the Andes where, regardless of its capacity or fertility, the land is devoted to the sole product that can be transported to the coastal area.

This diversification has made it possible for the sierra's agricultural production to supply the coastal markets with foodstuffs and raw materials which Peru is short of. Thus, for example, although the area accounts for less than 8 per cent of the agricultural land under cultivation, it produces 15 per cent of the country's potatoes, 16 per cent of its unmilled maize, 18 per cent of its barley and 21 per cent of its wheat, which is Peru's main import commodity. While its beef output is comparatively low (7 per cent of the total for Peru), it provides over 12 per cent of the country's milk products thanks to its production of alfalfa, which represents 13 per cent of the national output.

The available data indicate therefore that this is an open economy with a well-balanced structure. The agricultural and services sectors support each other and also quite a large artisan-type industry. The area's economic growth is based on the savings of its inhabitants, most of which are invested locally, the remainder being invested abroad through the trade banks.

In recent years, a certain number of manufacturing industries have sprung up and investment in tourist facilities has increased. For the most part, however, the area has been getting its manufactures from the coastal region, and, as one of the few mountain areas that has been incorporated into the monetary economy, it is an important market for industries (such as textiles and footwear) that have exhausted the possibilities of import substitution.

(c) *The economy of the Department of La Libertad*

The Department of La Libertad provides a significant share of Peru's domestic product and of its foreign exchange earnings as it possesses the country's largest agro-industrial complexes, which employ 40,000 people and account for some 50 million United States dollars of the country's income in foreign exchange. Though sugar production increased relatively slowly during the 1960s, investment in the manufacturing sector was substantial, and steady enough to make Trujillo, the Department's capital, a large industrial centre. Moreover, investment in roads penetrating into the Amazon valleys has contributed towards the apparently rapid economic growth of the mountain area, which sends its surplus production to Trujillo and other coastal markets in the Department.

Trujillo is the centre of Peru's main sugar-growing region and a city that is in process of industrialization. It is also the home of a great many artistic and archaeological treasures. The centre of the city, which was founded in 1534, boasts numbers of ancient mansions and churches which attract an increasing number of tourists from home and abroad. On the outskirts can be found the huge ruins built during the Chimú period, including the imposing town of Chan Chan, which covers seven square kilometres. The mansions, churches and ruins were all severely damaged by the earthquake of 31 May, but no estimate of the cost of rehabilitation has yet been made. The same applies to the University of Trujillo, whose biological and industrial research laboratories were built with credits from the Inter-American Development Bank and with technical advisory assistance from UNESCO.

The economy of the sierra area of La Libertad somewhat resembles that of the same area in the Department of Ancash, described above. It has numerous towns with from 5,000 to 25,000 inhabitants, and a diversified agriculture (though devoted mainly to cereals, potatoes, and fruit), and a substantial section of its population is employed in the services sector. Unlike the Ancash area, on the other hand, land ownership follows the old patterns of large estates in a few hands, but this is offset by the large number of tenant farmers. Another difference is that it is not far away from the market centres of Trujillo and other coastal towns. For the rest, the foregoing description of the Ancash sierra is also valid for that of La Libertad.

(d) *The economy of the Department of Huánuco*

Huánuco, being linked to Lima by the main means of communication with the Amazon plains, is one of Peru's in-migration departments. Migration is encouraged by the fact that it is made up mostly of Amazon valleys more than 1,000 metres above sea-level.

The parts of Huánuco that were affected by the earthquake, however, are the provinces bordering on Ancash. The Central Cordillera of the Andes where there are vast plateaus and numerous valleys formed by tributaries of the Amazon traverses this area. Apparently heavy in-migration from the neighbouring departments has been going on here too, so that available population statistics may not accurately reflect its growth. Suffice it to say that a large number of towns with from 5,000 to 8,000 inhabitants have sprung up in the area, and that part of its agricultural produce is sent to the rest of the Department of Huánuco and, *via* Ancash, to Lima.

Transport is often lacking, and the social infrastructure is very inadequate because in-migration is such a new phenomenon. To a certain extent, therefore, this is a developing regional economy, the earthquake damage to which could not be evaluated satisfactorily, even on a preliminary basis (as in this report), since, as will be shown below, the effects of the catastrophe on the eastern slope of the Cordillera Blanca are still unknown.

(e) *Problems facing the national economy as a result of the earthquake*

The tremendous damage caused by the earthquake coincides with the programme of economic recovery being implemented by the Government. In 1969, the economic growth rate was less than 2 per cent, under the effect of the stabilization plan introduced in 1968. In the second half of 1969, however, there were definite signs of an up-turn in the economy.

The decline experienced in 1968-1969 led to more widespread unemployment and, undoubtedly, underemployment as well. In 1969, private investment failed to respond to the various incentives which the country's economic policy provided; and, whereas public investment rose by 11 per cent, private investment actually dropped by over 10 per cent. All in all, domestic investment fell 7 per cent. In accordance with the Operational Budget for 1970, the Peruvian Government was attempting to arrest this downward trend. To do this, it planned an increase of 46 per cent in domestic investment, at current prices, which was designed to bring about a 7 per cent rise in the growth rate of the gross domestic product. The driving force behind this new investment rate was to be public investment, which was supposed to climb by 50 per cent at current prices.

Since unemployment had been on the way up in 1968-1969, the investment programme was intended specifically to combat that trend. In view of the importance of construction work from the point of view both of economic recovery and of employment opportunities, the Government project involved giving it a powerful impetus through public investment in infrastructure and increased investment in housing. According to this plan, the construction sector should attain a growth rate of 25 per cent, thus offsetting the decline of the two previous years. It should be pointed out that, whereas it was planned to concentrate public investment to some extent in the Department of Lima, the investment resources of the public sector will now have to be spread over nearly all the departments in the country.

The first and most tentative estimates of the absolute minimum of resources needed to prevent an immediate out-migration from Ancash to other parts of the country, to revive Chimbote's manufacturing industry and restore the balance of the economy of the Department's mountain area are roughly the same as the figure for the 1970 public investment programme. In other words, the Government is faced with a serious dilemma. If the process of economic recovery initiated towards the end of 1969 is to continue, then it must maintain its investment programme. At the same time, it must forthwith provide funds for the rehabilitation of the devastated areas. Hence the pressing need for outside financial assistance that would enable the country to maintain a reasonable balance in its national activities.

In recent years, taxation has risen sharply and the tax system is currently being reformed so as to remove its existing inflexibilities and inconsistencies. Until this reform produces results, however, the financing of the rehabilitation programme for Ancash without causing inflation will largely depend on the sources of outside savings to which reference has been made.

3. *Preliminary appraisal of the earthquake damage*

As stated above, it is impossible to make a human and social, technical and economic appraisal of the earthquake damage and effects as early as this. The main task of all the personnel that has been mobilized is to deal, first and foremost, with the human problems resulting from the disaster, secondly, to restore transport and communications, and power, water and sewerage services, and thirdly, to provide temporary shelter for the homeless.

Moreover, there are large areas which are still inaccessible, on which the fragmentary information that has been collected is completely inadequate, in quality and in quantity. For example, many buildings which appear to be intact or only slightly damaged from an aerial survey are really a total loss because of structural damage to their main walls. It is not yet known even whether the walls of important industrial plants are out of plumb or there have been subsidences of their foundations which will make major repairs necessary; neither is it known whether small instruments or equipment, which may take months to replace, have been damaged also.

On this flimsy basis the Mission has endeavoured to interpret the data thus far available and to arrive at a very rough preliminary assessment of the human and material effects of the disaster in the light of its own observations in the area.

(a) *Casualties*

Although the official number of casualties is still far from being accurately determined (and will probably never be really known), the following estimated figures were announced on 13 June: 20,000 dead, 30,000 injured and 40,000 missing. In Yungay and Ranrahirca alone some 18,000 people were buried under the landslide; in fact, of the 20,700 inhabitants of these two towns, barely 2,500 were registered during the rescue operations. The number of dead plus the number of missing does not necessarily represent the total death toll, however, since it is quite possible that once this phase of understandable confusion is over, the final figure will be somewhat lower.

Up to that date, the National Emergency Committee had recorded 2,920 dead and 13,021 injured; while 21,069 persons, relatives or friends, had been reported missing, and 402 persons had been evacuated from the danger areas—apart from the injured that had been taken to towns and hospitals for treatment. Transport was almost entirely by plane and helicopter, in view of the difficult access to the population centres affected, except in the case of coastal towns situated along the Pan American Highway. The Committee also considers that it is imperative to transfer about 50,000 people from the most devastated areas to other parts of the country.

(b) *Houses and other buildings*

The destruction of houses and other buildings in urban centres would seem to represent the biggest loss in terms of capital goods.

The magnitude of the earthquake was compounded by poor construction, as is apparent to anyone observing the ruins in the most severely affected towns. Apart from the poor quality of some of the materials used, some of the practices in the use and disposition of the materials are very unsatisfactory (even for the prevailing type of one-storey building), and clearly show the lack of, or failure to comply with, technical building standards.

In the loose and sandy soil of the coast, where the water-table is very high, many buildings collapsed because the foundations were not deep enough. There is a general lack of structural binding or tie-ins in buildings both in the coastal region and in the sierra. In contrast, the few buildings which have reinforced concrete pillars at the angles of the main walls with reinforced concrete ties overhead and are properly designed and constructed on sound foundations stood up well to the earthquake shock, even some two- and three-storey houses.

Dwellings in the sierra region have heavy roofs with mud tiles and roof joists resting on walls without any lateral binding, and often they have no sleeper joists that will withstand the horizontal stress.

The information available is still too scanty to determine with any degree of accuracy how many houses have been destroyed. Considering the percentage of destruction estimated by the National Emergency Committee for some localities (on the basis of aerial photographs), the population data obtained from the Statistics and Census Office, and the number of inhabitants per dwelling according to the 1961 Census, it may be estimated, as a first approximation, that 90,000 to 100,000 urban and rural dwellings were destroyed in the Department of Ancash alone. This number includes a wide variety of dwellings in terms of type of housing, area and value, including those called *chozas* (hovels). If the destruction in the adjacent departments is taken into account the number may well be as high as 110,000. The number of homeless is probably, therefore, more than half a million.

The homeless in the sierra area require special attention since, because of the altitude it is very cold and the rainy season starts in September.

The construction of new dwellings similar to those destroyed but better designed to withstand earthquake shocks would cost at least 5,000 to 6,000 million soles (125 to 150 million dollars).

The expenditure on dwellings will be even higher because of the repairs that will be necessary in the case of those which are still structurally sound, although strictly speaking the losses due to the earthquake may have been less because they were old and crumbling before the disaster occurred.

In addition to dwellings, a great many buildings have been destroyed or made unusable, such as public administration buildings, hospitals, clinics, schools, churches, banks, sports pavilions, etc. Even before the earthquake there was already a shortage of hospitals, clinics, health centres and first-aid posts in the Department of Ancash; altogether there were thirty-six medical centres with about 1,000 beds. Many of these will no doubt have been destroyed. It is already known that the Barranca hospital and the recently constructed hospital at Casma were destroyed, and that the Workers' Hospital in Chimbote was seriously damaged.

There has also been widespread damage to educational institutions, but it cannot be evaluated because the information available is insufficient in quantity and coverage. This is what the Mission was told in Chimbote, where it saw two schools that had been completely destroyed. In 1966 there were 1,641 schools attended by 150,000 children in the Department of Ancash, following increases of 7.2 and 19.9 per cent annually in the preceding four years in the number of primary and secondary schools, respectively. In the neighbouring Department of La Libertad, half the Universidad de Trujillo is in ruins and the other half is seriously damaged.

Other public buildings are known to have been damaged and in some cases completely destroyed.

It seems appropriate to estimate the total loss at somewhere between 600 and 800 million soles (15 to 20 million dollars), depending largely on the amount of equipment that has been destroyed in hospitals and in the university. As in the previous case, this estimate represents the investment required to replace the ruined buildings by new ones of a similar type but which are structurally better and more functional.

(c) *Urban centres and health services*

In urban centres, there has also been widespread damage to roads and to drinking water supplies and sewerage services. In the main towns of the most severely affected region, the sewers are not operating at all, while the coastal towns are faced also with drainage problems. The most seriously damaged drinking water supplies (Chimbote, Casma, Huarmey, Huaraz, Recuay, Chiquián, Aija, Caraz, Yungay, Ranrahirca, Carhuaz and Marcara) used to provide water for 152,000 people through 10,500 branch connexions to houses and an unknown number of public fountains. The supply systems cover more than seventy kilometres. The sewerage systems (Chimbote, Casma, Huarmey, Huaraz and Yungay) totalled about forty-six kilometres in length and comprised more than 5,000 branch connexions to houses.[2]

Chimbote, with an estimated population of 290,000 inhabitants after the earthquake (some 80,000 are thought to have flooded into the town in the ten days following the disaster), previously had connexions to around 40 per cent of its houses. The remainder get their water from public fountains, water carts and private wells. The town is normally supplied by four wells connected to a network consisting of iron and asbestos cement pipes which burst during the earthquake. The pumping system broke down when the electricity supply failed, and the water-towers have yet to be checked for structural damage.

The sewerage service[2] comprises three independent systems discharging into the sea which serve the sections of the town that have a drinking water supply. The rest of the population throws its dirty water into open drains. Although the exact state of the sewerage system is still unknown owing to the breakdown in the water supply, there is every reason to suppose that it has suffered severe damage.

The town also uses ten drains to lower the water-table, which is very high, and empty the water into the sea. Since even under normal conditions it does not operate satisfactorily, there are now some 300 hectares of waterlogged ground which are a potential source of pollution. As a result of the earthquake the situation has deteriorated owing to the blockage or bursting of the drains and to the fact that, with the drinking water and industrial wells out of commission, the water-table has risen further, bringing with it the additional risk of pollution and threatening the foundations of certain buildings.

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[2] Information supplied by PASB/WHO.

In the towns situated in the Callejón de Huaylas, the drinking water and sewerage systems apparently catered to a smaller proportion of the urban population. Instead, there are a great many private wells serving various purposes and sewage disposal systems that empty directly into the Santa river.

Considering the characteristics of the existing services, the need to rebuild certain towns on new sites and the necessity of equipping the new dwellings with adequate services, the investment required for the above-mentioned urban public services is estimated at no less than 600 million soles (15 million dollars).

(d) *Transport infrastructure*

(i) *Damage to the road network.* According to information supplied by the Ministry of Transport and Communications, the road network of the entire area affected by the earthquake is some 4,320 km in length, i.e., 8.7 per cent of the country's entire highway network.

LENGTH OF ROAD NETWORK IN THE EARTHQUAKE AREA AND PERCENTAGE OF THE NATIONAL TOTAL

	Length (km)	*Percentage*
Paved[a]	443	9.1
Improved[b]	119	1.4
Earth[c]	2,498	17.9
Negotiable paths[d]	1,260	5.6

[a] Asphalt surface.
[b] Surface of graded materials.
[c] Surface of non-graded gravel materials.
[d] Running in random directions.

The most severely damaged stretches of paved road are the Pan American Highway, running along the coast, the partially paved Huaraz-Sihuas highway in the Department of Ancash (Callejón de Huaylas), and a few roads in the Department of Lima. On the remaining roads, most of the damage was in the Department of Ancash, and about 30 per cent of its improved roads, 80 per cent of its earth roads and over 60 per cent of its negotiable paths were affected. Official statistics for 1968 indicate that most of the Ancash network was made up of earth roads and negotiable paths.

The damage to various stretches of paved roads, including the Pan American Highway, took the form of collapses of the roadbed, cracks in the roadbed and in the asphalt surfacing, slipping of the road-filling and shoulders, minor landslides and collapses and, as regards the bridges, subsidence of the infrastructure pulling the superstructure out of alignment.

The effects of the earthquake were more serious in other roads. There are massive falls of rock and other materials which have covered the whole road on many stretches, slipping and collapses of the roadbed, repeated minor earthfalls and subsidences, total or partial destruction of many bridges and severe damage to the entire drainage system.

Despite the interruption of traffic along many roads immediately after the earthquake, as the Mission was able to appreciate, the competent bodies of the Ministry of Transport and Communications made a tremendous effort and succeeded in reopening the roads to traffic within a few days,—though often on a makeshift and provisional basis—along a large section of the main arteries.

The Mission was also able to co-operate with officials of the Ministry in considering a preliminary assessment of the damage sustained by the public road network. A conservative estimate sets the damage at around 549 million soles (13.7 million dollars), of which 541 million for the repair of the roads themselves, and the remainder for equipment, material and buildings of the highways department.

(ii) *Railways.* The only railway line affected by the earthquake runs between Chimbote and Huallanca and is operated by the Corporación del Santa. No information has been forthcoming on possible damage to the railway line between Trujillo and the port of Salaverry, or to the railways in the Department of Lima, but this is not thought to have been extensive.

The Santa railway line between Chimbote and Huallanca is 168 km long, including branch lines, and has a 0.914 metre gauge. The rolling stock consists of ten old steam locomotives, eight passenger coaches and 124 freight cars. The freight traffic (35,000 tons a year) represents less than 1 per cent of the country's total railways traffic. In recent years it has also been running at a heavy loss owing to the limited traffic and the age of the permanent works and the rolling stock.

Judging from information obtained by the Mission, much of the Santa railway track has been destroyed, mainly by the wave that swept down the Santa river as a result of the *huayco* which buried Yungay and filled at least a fifteen-kilometre stretch of the river bed with mud. In view of the present situation and the dim prospects for railway transport in the area served by this line, it would be advisable to take advantage of the earthquake to scrap it and build a road along the railway track instead. This proposal is being considered by officials of the Ministry and the management of the Corporación del Santa.

(iii) *Ports.* The earthquake area includes a number of seaports, of which Chimbote and Salaverry are of particular importance. Of the rest, Huarmey, Supe and Huacho are not very important, and Casma is just a small fishing port. Chimbote ships about 15 per cent of Peru's exports, not counting its iron ore, and Salaverry 6 per cent; the remainder together handle about 4 per cent. Coastal traffic accounts for 18 per cent.

Initial estimates of the Water Transport Department set the damage to these ports at 7.6 million soles (190,000 dollars), 5.7 million of which for Chimbote.

The damage to the port of Chimbote consists mainly of the destruction of the port terminal, cracks in the main dock, a difference in level between the part of the wharf built on piles and the part built on filling, and damage to the electricity supply installations.

As for the Port of Salaverry, the most serious factor is that to operate the loading machinery for bulk sugar, the principal commodity handled by the port, electric power has to come from the hydroelectric power station of the Cañón del Pato, the condition of which is dealt with elsewhere in this report.

Most of Peru's exports of fish meal go through Chimbote. The coastal trade is mainly in SOGESA iron ore.

(iv) *Civil aviation.* Nearly all the damage was in the airport of Caraz, in the Callejón de Huaylas. Three quarters of the airport is covered to a depth of several metres by material brought down by the avalanche. To facilitate the resumption of air traffic, a landing strip has been put into operation at Anta, and it is probable that the airport that was destroyed will be rebuilt there. The airports of Chimbote, Trujillo and Lima suffered only minor damage.

The total damage suffered by civil aviation has been estimated by the Ministry of Transport and Communications at 12.2 million soles (3 million dollars), 7 million of which are accounted for by the devastation of the airport at Caraz and 5 million by the temporary operation of the airport at Anta.

(v) *Summary of the estimates of damage to the transport infrastructure.* The following table shows the cost of the damage to the transport infrastructure.

		Millions of soles
Highway infrastructure		549.3
(*a*) Roads	541.0	
(*b*) Equipment and other installations	8.3	
Railways		200.0
Ports		7.6
Civil Aviation		12.2
TOTAL		*769.1*

(e) *Communications*

The earthquake cut off nearly all lines of communication within the earthquake area and between that area and other parts of the country.

In the zones that were not seriously affected and along the coast itself it has already been possible to re-establish a good part of the communications, but the process will be much slower in the interior, where, particularly in the Department of Ancash, post offices, telephone exchanges and telegraph and wireless stations suffered the same fate as the houses.

Preliminary estimates of damage amount to 18 million soles, of which 7 million would go to the telegraph offices and telephone exchanges and the cable network, and 10.8 million to post offices.

In addition to the above, mention should be made of the damage suffered by the Compañía Nacional de Teléfonos del Perú, estimated at 11.3 million soles, most of this figure corresponding to damage to cables and private lines in the coastal zone between Trujillo and Lima and in the Callejón de Huaylas. In weighing the importance of this damage, account should be taken of the fact that many installations were very out of date.

(f) *Electric energy*

At the time of the earthquake, forty-one villages in the Department of Ancash were supplied with electrical energy, twenty-one of them by the Cañón del Pato (Huallanca) hydroelectric power station. The rest were supplied by twenty small independent stations, half of which were hydroelectric. There were, in addition, more than fifty small private generating plants.

According to the Electricity Board (MEM), the electricity supply of eight other villages outside the Department of Ancash failed, particularly the Trujillo area and neighbouring villages (Moche and Salaverry) served by the Cañón del Pato station. The extent of the damage to installations in other villages and to industries with their own electricity supply is not yet known.

The total installed capacity of the Department of Ancash is 137,000 kW, three quarters of which corresponds to public services. The Cañón del Pato station, with a capacity of 100,000 kW, is much more important than the other and supplies electricity through a network transmission line to the towns of Chimbote and Trujillo, on the coast, and all the villages in the Callejón de Huaylas, down as far as Huaraz and Monterrey.[3]

The power station derives its energy from the normal flow of the untrained river Santa and has its inlet works in a steep-sided gorge in the river valley. After passing through the straining grid for gravel and silt, the water goes through the inlet pipe (more than 8 km long) with a capacity of 48 m^3 per second. A vertical iron-sheathed shaft in the rock leads the water to the underground power house (a cavern in the rock) with four groups of generators (each with a capacity of 25,000 kW) powered by pelton turbines. Between the inlet pipe and the shaft there is a surge chamber, also cut out of the rock. The station generates 300 million kW annually, but, before the disaster, an output of 400 million kW was forecast for this year.

At the time of the earthquake, the station stopped operating, apparently through the normal working of its security system, and subsequently the intake works were closed by the staff, who were then forced to abandon the station.

When the Mission was in Peru, no inspection had been made of the damage, but according to the accounts given by the staff operating the plant at the time of the earthquake, and from the nature of the design of the plant, it is hoped that the problems may not be very serious and may be limited to: blockage of the intake and outlet works by fallen debris and material swept down by the river and by the wave that followed the avalanche that buried Yungay and Ranrahirca and destruction of part of a high cable transmission line to Chimbote, which has already been mentioned. Less probable but possible are: damage to the surge chamber, the shaft (or penstock), the high-tension switch-gear and the mobile equipment through being forced out of alignment.

A very rough estimate of the damage, which was supplied by the Electricity Board but can only be considered as guess work in so far as it relates to the Cañón del Pato station, amounts to 280 million soles (7 million dollars), about half of which would be for repairs to distribution networks.

The lack of electric energy, principally in Chimbote and Trujillo, where local thermal plants are providing emergency supplies for lighting and pumping, appears to be the principal obstacle to the resumption of many activities. The reopening of the steel plant belonging to the Sociedad Siderúrgica de Chimbote, S.A. (SOGESA), which according to preliminary estimates could be in operation again in two months, may be out of commission for longer than that since it will depend on when the Cañón del Pato station is put back into operation.

(g) *Agriculture and irrigation*

As was seen earlier, intensive agriculture is carried on in the Department of Ancash along the coast in the Santa, Sechín, Huarmey, Nepeña and Casma valleys and is basically dependent on irrigation (20 per cent of the total area under cultivation), while in the sierra, dry, seasonal and irrigated crops are grown in the longitudinal valleys of the Huaylas and Conchucos (80 per cent of the total area under cultivation).

The May earthquake pushed the zonal economy out of balance and cut it off from the national economy. The effect of the earthquake on the rural areas has not been such as to prevent farmers from returning to their land, but the large-scale destruction of towns and the loss of tools and stocks of merchandise are a serious obstacle to the return to work of persons employed in trade and public services. An unchecked exodus of the population to other areas might, therefore, mean that the mountain area of Ancash would become another depressed area of the Peruvian sierra, with the consequent loss of part of the market for manufactures.

When the Mission was in the country, the competent authorities had not yet been able to assess the damage to agriculture. An unofficial source (Sociedad Nacional Agraria) reported that 50,000 hectares of farmland on the coast, throughout the area ravaged by the earthquake, had been damaged by the destruction of wells, pumping equipment and irrigation channels, which would take some months to repair. Government sources feared that 38,000 hectares in the same coastal zone would not receive additional irrigation at the right time before the harvesting season, such irrigation being essential if yields were not to be substantially reduced. The reasons were the same as those previously mentioned: damage to different parts of the irrigation system.

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[3] Huallanca–Chimbote: 2 × 66 mW; 138kV; 95 km.
Chimbote–Trujillo: 36 mW; 138 kV; 123 km.
Huallanca–Huaraz: 10 mW; 66 kV; 92 km.
Huaraz–Monterrey: 2 mW; 13.8 kV; 5 km.

In the ground and air trip which the Mission made to part of the Callejón de Huaylas, it estimated that about 1,000 hectares of farmland in that zone (0.7 per cent) were destroyed by the *huayco* and landslides. It was also noted that, as a result of above-average rainfall, the land under cultivation was in good condition. On the other hand, since in the irrigated zones the water is taken at relatively high levels from the tributaries of the Santa and flows by gravity down channels which take full advantage of the slope of the land so that the channels do not need to be so long or the space between them so great, the damage may not be very extensive. The channels that have been destroyed will probably affect only small areas. In the Callejón de Huaylas, the damage to the transport network may set a ceiling on agricultural production.

A rough estimate of the losses in this sector on the basis of the above information would be about 280 million soles (7 million dollars) including the investment needed for the reconstruction of some irrigation works, the decrease in agricultural production if additional irrigation cannot be carried out on the coast before the harvest, and the loss of cultivable land destroyed by the *huayco*.

(h) *Industry and fishing*

Up to the time of the earthquake there were eighty-seven industrial enterprises registered in the Department of Ancash, forty-five of which employed more than ten workers, thus providing employment for approximately 6,000 persons. The forty-five enterprises comprise SOGESA, which alone employed 1,600 workers; about forty fish meal plants, thirty of which were in Chimbote; one sugar mill; and some small boatyards for the building and repair of fishing vessels. Most of the remaining enterprises, which employ fewer than ten but more than four workers, produce consumer goods for local or regional consumption, particularly essential goods. The rest are artisan-type activities in which quite a high proportion of the population is employed.

According to information supplied by the Ministry of Industry and Trade, it was impossible for the moment to hazard even an approximate estimate of the damage which these industries have sustained as a result of the earthquake.

Operations in the SOGESA steel plant had been stopped so that it could be overhauled and the damage evaluated; the damage to the plant and equipment is probably considerable. Most of the damage, however, is thought to consist of fallen masonry and the minor destruction this may have caused. It may well be that some of the instruments and minor equipment will have to be imported. Levels and alignments are being checked. It is certain that some of the fire-proof facing was destroyed; the exact state of the blast furnace is not known. It is considered likely that this damage will prevent the plant from resuming operations for a period which has not yet been determined but would be from two to three months, unless the overhaul reveals further damage. The loss of profits may well be substantial.

The information obtained on fish meal plants indicates that they have not sustained any major damage to their machinery—mainly settlement of the bases and equipment out of alignment—which may be quite serious, or their buildings. The Coishoa plant, however, sustained some damage as the result of a big landslide on a nearby hill.

Presumably the remaining industries, including small enterprises employing fewer than ten workers, and artisan-type activities, have been seriously affected and many of them are at a standstill owing to collapsed buildings and the consequent destruction of their equipment.

Total losses in buildings and equipment are estimated at about 200 million soles (5 million dollars).

From available data on the value of industrial production, the effects of the earthquake may be estimated in terms of production losses. The value added in the annual production of the forty-five enterprises mentioned above was 1,725 million soles in 1968. Assuming that the value of the production of the remaining enterprises and of artisan-type activities amounts to a similar figure, the total loss of industrial production per working day would be about 15 million soles.

As regards the fishing industry proper, neither the boats nor the unloading facilities were damaged, so that operations can be resumed as soon as the fish meal plants are in a position to resume operations (the Mission was informed that this is the closed season). In other types of fishing activities, the most critical point is the state of the refrigerating chambers and equipment, which has not yet been properly checked.

(i) *Mining*

Mining is another sector which plays a not unimportant part in the economy of the Department of Ancash. In 1967 it provided employment for 3,128 persons, of whom 2,715 were manual workers. Mining output comprises a wide range of metallic and non-metallic minerals, which in 1965 amounted to a total gross value of 137 million soles, or 1.5 per cent of the total gross value of Peru's mining production. The most important metalliferous ores are silver, copper, lead, zinc and tungsten, and the non-metallic minerals include guano and limestone.

There were six ore-smelting plants in the Department of Ancash, with a total capacity of nearly 1,000 tons a day. According to a report of the Banco Industrial del Perú, the area has appreciable reserves of various metalliferous ores, but there were only a few mining companies in operation for want of roads for transporting the ore at reasonable rates.

The Mission was unable to obtain information regarding the earthquake damage sustained by the mining sector, but since the mines are located in the most severely devastated parts of the Department, it must be assumed to have been considerable.

(j) *Commerce and tourism*

In view of the complex and varied nature of this sector, it is obviously difficult to evaluate the extent of the damage it has sustained. Before the earthquake, the Department of Ancash had about 200 commercial establishments, 40 per cent of which were of fair size. In addition there were several thousand retail establishment enterprises making sales direct to the consumer.

Most of the losses suffered by this sector were due to the destruction of stocks, and more particularly to the destruction of and damage to commercial buildings and premises. For the purposes of the present report, therefore, it may be considered that the losses sustained are largely included in the preliminary estimates of the damage and destruction of dwellings and other buildings.

There will naturally be a loss of profits in these activities during the emergency period in which essential consumer goods are being supplied to the population in the disaster area.

According to information gathered by the Mission, tourism warrants special attention as one of the most important factors in the reactivation and economic development of the earthquake area, particularly the Callejón de Huaylas. Indeed, the scenery in this area is considered by international experts to be among the most beautiful in the world, and there is the additional attraction of the remains of pre-Colombian civilizations and a wealth of folklore. The art treasures of the Chimú civilization in the Department of La Libertad are also very valuable.

Up to the time of the earthquake, however, there were only four hotels in the whole area —at Huaraz, Monterrey, Chavin and Huallanca—with a total of 130 rooms for the accommodation of tourists. This very modest capacity shows that tourism is still in its infancy. The hotels have sustained a medium amount of damage, estimated at 2.7 million soles, although some 15 million soles must be added to cover losses represented by the destruction of tourist attractions: museums, archaeological sites and mineral springs.

To give tourism more value as a factor in the region's future development, it would be advisable, not only to improving the hotel facilities and increase the amount of accommodation available, but to improve access and other roads for vehicles touring the zone, and to build a new airport that would meet tourist requirements; according to a project already in existence, this airport would be located at Anta, and would be able to take medium-range jets.

(k) *Summary of the preliminary assessment of earthquake damage*

As stated above, the Mission has, for obvious reasons, been unable to obtain an official estimate of the damage caused by the earthquake. To arrive at a figure which would be acceptable to the authorities would be a long and difficult task, and the results would not be known until after several month's work had been done.

During the Mission's stay in Peru, the press estimated the damage at 230 million dollars, without furnishing any details or explaining how this figure had been arrived at.

The Mission considers that the material losses can be broken down into at least three large groups of figures: the cost of the emergency, deducting the value of the donations of food, medicines and services of all kinds which Peru has received; the actual material destruction; and the economic and social losses sustained, i.e., the loss in profits in every imaginable form.

In the light of all these factors, the Mission considers that the above figure falls short of the truth, and that a closer estimate of the earthquake damage would be some 300 million dollars.

4. *Organization of emergency operations and the Reconstruction and Rehabilitation Committee*

The Government took immediate steps to tackle the problems arising out of the disaster at two separate levels:

(*a*) Urgent action needed to deal with emergency situations in the earthquake areas; and

(*b*) Reconstruction and rehabilitation.

The responsibility for the first category of tasks lies with the National Emergency Committee which operates under the Ministry of Health and acts as a staff headquarters for the control and co-ordination of all operations for the various emergency committees in the different areas. The National Emergency Committee records all verified data on the number of persons dead, injured, missing and evacuated, and makes supplementary guess-estimates of the numbers of dead, etc., as yet unknown. The Committee evaluates material damage on the basis of aerial photographs and information obtained on the ground, supplied by the country's different technical services. At the same time, it acts as a centre for the reception of all kinds of material aid from whatever source, keeps a record of it and dispatches it to the emergency zones in accordance with the needs notified by the Committee's own sources of information or at the request of the local emergency committees; these operations are carried out with a very careful control of the movements of ships, aircraft and vehicle convoys.

The earthquake area can be divided into four broad zones: the coast; the Callejón de Huaylas; the intermediate zone stretching from the Cordillera Negra to the coast; and, lastly, the area to the east of the Cordillera Blanca. Assistance has been sent to these zones in the order indicated, the coast and the Callejón de Huaylas being the most badly affected.

The zonal emergency committees are responsible for everything that has to be done in their zones: clearing debris, burying the dead, caring for the wounded, providing food and shelter, re-establishing essential services, maintaining health control and starting up economic activities once more. The people are co-operating very well. The Mission was able to observe permanent repairs and total reconstruction being carried out side by side with the construction of light emergency dwellings suited to present weather conditions, which may be considered as partially adequate for the time being. However, the cold nights in the mountain areas and the Callejón de Huaylas may lead to sickness and death from exposure, and the influx of rural population into the already overcrowded town of Chimbote makes health control difficult and brings with it all the problems of a devastated city.

Rehabilitation of reconstruction were started immediately.

On 9 June, the Government promulgated Decree No. 18306, establishing a Reconstruction and Rehabilitation Committee composed of highly-qualified experts in the numerous tasks coming within its terms of reference. It is presided over by a Minister of State.

The Committee is responsible for the overall planning of all the reconstruction and rehabilitation work, and it is clearly understood that this involves restoring normal conditions in the area and setting it on the path to future development. Apart from the work of reconstruction, this includes solving the problems typical of the earthquake area, such as the surplus agricultural population in the Callejón de Huaylas, and the possibility of creating other labour-intensive economic activities or of promoting a certain amount of migration to suitable areas that have been prepared to receive it, establishing an infrastructure that is better suited to the needs of the area, making certain essential productive investments which have been under consideration for some time, etc. In particular, towns and villages will be rebuilt on carefully selected sites which offer the best chance of preventing the recurrence of the all too frequent disasters that have occurred in the Callejón de Huaylas or where the soil is most favourable for building, drainage and permanent health facilities.

Apart from its planning and co-ordinating powers, the Committee also has an executive branch, which has its own financial resources: "All the national and foreign resources intended for the reconstruction and rehabilitation of the earthquake area shall be administered by the Committee" (Art. 6). A *pliego*, i.e., a budget item under the exclusive control of the Committee, was opened immediately, with an initial allocation of over 700 million soles thanks to cuts in other items of the National Budget.

In the execution of its tasks "the national agencies of the public sector shall provide any support requested of them by the Committee" (Art. 5). This means that if certain roads must be built for the purpose of rehabilitation, the Ministry of Transport will supply the engineers, technicians and teams of workmen needed to plan and carry out the work, as far as they are able, without prejudice to the Ministry's responsibility to the rest of the country. If sufficient staff are not available on loan, the Committee will recruit the additional staff needed.

The Mission considers that having a single body to plan and carry out emergency tasks is a very good solution; it will prevent the reconstruction and rehabilitation work from being swamped by every-day activities as time goes on and from losing the unity and impetus which are required to make good the losses caused by the disaster.

5. *Some prospects for rehabilitation*

A rough preliminary figure was given in the third section of the present document for the damage wrought by the earthquake; this figure does not necessarily cover all the required expenditure on repairs and reconstruction, which are likely to be, on the whole, much higher, since the construction to be done will have to be of higher quality than that which existed previously.

However, the Government is well aware that it is necessary not only to reconstruct but also to rehabilitate and develop. If the disaster has a good side, it lies in the possibility of organizing the economy and life of the earthquake area and the neighbouring areas along more rational lines, better suited to present-day conditions. In addition, at both the local and national levels people are anxious to set about the work of reconstruction with the support of the nation and a desire for progress which should get the response it deserves in the form of international technical and financial co-operation.

This effort should be made on the basis of suitable regional planning within the framework of national development.

Naturally, the Mission could not expect to obtain any precise opinions on this point. As a very rough provisional estimate, the Reconstruction and Rehabilitation Committee considers that, to carry out the tasks mentioned above, it will need about 520 million dollars.

As no plan has yet been drawn up, only an outline can be given of the prospects for the rehabilitation of the earthquake area.

In respect of fixed assets, a distinction must be made between the manufacturing capacity in the Chimbote and Trujillo zone and all the dwellings, community services and communications that have been damaged throughout the earthquake area.

The rehabilitation of industrial equipment in Chimbote, including the electric power stations which are vital to it, and the prospects for the speedy rehabilitation of the town, depend on technical factors and, to a lesser extent, on financing. In one way or another, the firms that supply the industrial equipment could contribute a certain amount of technical advice and suggest specific plans for financing.

In Trujillo, manufacturing capacity does not appear to have suffered any major damage. However, the cutting off of the electricity supply from the Cañon del Pato power station will paralyse many enterprises for several weeks.

As to the fixed assets of the coastal area, it may be pointed out that the rehabilitation of the agricultural areas would not raise any problems either. Most of the irrigation channels are still in operation, as are the irrigation systems using underground water.

The same is true of dwellings and other community buildings in the coastal area. In Trujillo, it would be necessary to rehabilitate the University and restore a large number of mansions, temples and pre-Colombian ruins, which are the city's tourist attraction. For lack of information on the cost of restoring these buildings, but on the assumption that the amount needed is relatively small, it may be expected that the city could be rehabilitated in a relatively short time.

The dwellings and community services destroyed by the earthquake in Chimbote raise a rehabilitation problem which also applies to other towns of the disaster area. Most of the town was built on loose, sandy soil, and with foundations that were not deep enough. The rehabilitation of this town may involve moving part of the town to a more favourable site, which would mean abandoning existing water and drainage networks of the whole town (which has an estimated population of 212000), even though they could be repaired effectively. Foreign credit will probably be required for its rehabilitation, matched by a substantial contribution from Peru in counterpart funds.

Obviously, the same soil problem as in Trujillo arises in several large towns in the Callejón de Huaylas, and it is even more serious there, since the towns must be moved out of the path of avalanches and, in some cases, because of the poor quality of the foundations. In all these cases, therefore, the estimated value of the damage is considerably lower than the amount required to provide a satisfactory solution to the housing problem.

The most essential fixed asset in much of the earthquake area is the communications. Although most of the main arterial roads were opened to traffic during the emergency phase, secondary roads and the negotiable paths, which served to transport the agricultural produce of the zone and fed traffic onto the main roads, have not yet been examined. The re-opening of these secondary roads is vital to the economic activity of the mountain areas of La Libertad, Ancash and Lima.

Compared with the damage to housing and the urban services infrastructure, the preliminary estimate of the damage to the transport and communications infrastructure appears to be relatively moderate. However, account should be taken of the comparatively low level of the previously existing infrastructure and the bad conditions it was in, and of the needs for rehabilitation, reconstruction and modernization.

According to preliminary estimates made by the Ministry of Transport and Communications, these needs would amount to more than 4,000 million soles for the disaster area alone. These estimates are based on plans for modernizing the national infrastructure, which were scheduled for execution in the next few years. It would now seem necessary to modify those plans so as to bring forward the execution of the projects and programmes in the disaster area, allocating additional resources for the purpose, so as to avoid delays in execution of projects and programmes in other parts of the country, which would have unfavourable effects on economic development.

Generally speaking, the efforts at rehabilitation should, in the first instance, be directed towards preventing large-scale migration from the towns to other parts of the country. To this end, funds would be required not only for building houses, but also for replacing equipment in artisan-type industries, retail trade, the hotel services used by national traffic, and the transport sector.

These are what can be considered the most pressing needs. Whether or not they can be properly and rapidly satisfied largely depends upon the availability of financial resources from the rest of the national economy and from abroad. The volume of investment required for rehabilitation in the immediate future is at least equal to, if not more than, the savings capacity of the country's entire public sector. The Peruvian Government has therefore applied to the Inter-American Development Bank for a loan of 35 million dollars and to the International Bank for Reconstruction and Development for a further 150 million dollars.

The financing from these sources, along with the funds that the Peruvian Government has already budgeted for and its transfers of allocations to the earthquake area, could probably meet most of the investment requirements for the kind of immediate rehabilitation outlined above.

In the opinion of the Mission and of many persons consulted during its visit, however, this rehabilitation would not be adequate in scope. In addition, a number of features of the region's future development also have to be taken into account. First among these come the development of the coastal manufacturing sector, population pressure and possible solutions for it, and the need, as has already been said, to adapt the area's transport system to the new pattern of development.

While, on the coast, the social problem is linked to the precariousness of a swift process of expansion, which raises social expectations and breeds shanty towns, the problem in the sierra is more one of stagnation and of the marked absence of any manufacturing activity of note, including a complete lack of industrial capacity for processing the agricultural produce of the zone itself.

The trans-Andean region is faced with the serious problem of limited communications with the rest of the country, but conditions there are very favourable, for it links the region with the somewhat warmer Marañon valley, provides access to the Huallaga land settlement area and to the valleys and the sierra between these two valleys in the sparsely populated Department of Huánuco. Quite apart from the resources deriving from the variety of climate, this region also boasts two mining projects of definite importance for the country's future, Antamina and Magistral.

This brief survey suggests a number of preliminary ideas for a rough outline of the region's possible development along the following lines.

Peru's development plans for the manufacturing industry should take into account the new form that the market for its manufactures may take as a result, among other things, of the signing of the Andean Subregional Integration Agreement. According to the Peruvian development plans, the manufacturing industry (excluding the fishing industry) of the earthquake area would not be in a position to expand its markets by exporting to other countries; but this situation could now be corrected.

In both La Libertad and Ancash, there are mountain areas which are experiencing a steady and appreciable process of out-migration. The path of the migrations is usually towards the coast, particularly Lima, but during the 1960s it also contributed to the unplanned and often makeshift settlement of the eastern areas lying in the Amazon basin. The flow of migrants is likely to increase as a result of the earthquake, particularly from the Callejón de Huaylas. Both the economic and the social prospects of these groups of migrants would improve if they were settled in new irrigated areas, some of which have already been studied, and in properly planned settlements in the Amazon valleys, particularly the Huallaga valley.

The irrigated areas are in the Chao and Viru valleys, the Chimbote pampas and in the northern part of the coastal area. These projects, some of which are already under way, could absorb a large number of families. As for the Huallaga valley, studies carried out by United Nations experts suggest that although settlements already exist as a result of spontaneous migration, there is still room for a larger population, once certain specific stages of the project have been completed. This will be made all the easier if an industrial, artisan-type and services sector can be developed so as to maintain an agricultural population not exceeding 50 per cent.

It has already been pointed out elsewhere in this report that great importance should be attached to the development possibilities of various regions in the eastern part of Peru, as these could absorb some of the surplus population from several areas in the Department of Ancash, particularly the Callejón de Huaylas. The restoration of the means of transport and communications in the earthquake area would entail a co-ordinated study of the development potential of both the most devastated region and certain neighbouring regions in the valleys of Marañon and Huallaga, and also of the regional and interregional infrastructure that would serve as the basis and framework for the co-ordinated economic development of the various regions involved.

Some form of collaboration in all these spheres between ECLA and ILPES and the Peruvian agencies responsible for the planning, reconstruction and economic and social development of the devastated area might produce very good results.

6. *Recommendations of the ECLA/ILPES Mission*

The ECLA/ILPES Mission feels that it would not be out of place to present a few comments and recommendations, although it is fully aware that its terms of reference are confined to the preparation of a technical report for the information of the delegations attending the extraordinary session of the Committee of the Whole of the Commission, which was convened at the suggestion of ECLA's Executive Secretary in order to consider the situation resulting from the earthquake which devastated the north-central region of Peru.

For many years the international agencies have concerned themselves with the serious human and material losses occasioned by natural disasters such as floods, earthquakes, hurricanes, etc., which affect large areas in different parts of the world, year after year. In each decade, several thousands of millions of dollars' worth of property is destroyed and many hundreds of thousands of lives are lost. These tremendous losses occur more often in the developing countries, not only because these countries cover the largest area and are the most densely populated in the world, but also because, not having yet made much progress towards development, they have fewer technical media for forecasting these disasters than more developed countries, and because the material means they possess for protecting themselves from the resulting devastation are much more limited and much less satisfactory. It can be said that, by and large, not enough emphasis has been given to the undeniable cause and effect relationship that exists between the occurrence of these disasters and the state of underdevelopment, inasmuch as they entail the continual destruction of human and financial resources, which seriously impairs the effectiveness of the efforts towards progress and development made by countries which have not yet advanced beyond the initial stages of development.

The countries themselves and international agencies—both public and private—have set up increasingly efficient machinery for providing aid to disaster areas and helping to deal with emergencies. Even so, these efforts prove insufficient when disaster suddenly strikes and devastates extensive areas of a country at the same time, interrupting its normal activities so seriously that the means which do remain available for aiding the stricken population are quite inadequate: this is, *inter alia,* the case of Peru.

The Mission considers that it is of the utmost importance that the Committee of the Whole should examine the problems and recommendations presented below, while recognizing from the outset that some of them may be outside the Committee's sphere of competence.

(a) *Direct ECLA/ILPES action in the rehabilitation and development of the area affected by the earthquake*

As may be gathered from the Mission's report, the Peruvian Government had gone a long way towards preparing a regional development plan for the north, covering eight departments, including two of the four directly affected by the earthquake (Ancash and La Libertad), which is undoubtedly where the destruction is greatest. At the same time, because of their manufacturing and fishing industries, these are the two most important departments in north Peru.

The new guidelines laid down by the Government for the medium-term policy for the country's economic development and reconditioning certainly reflect a different approach from that of national and regional planning. But there can be no doubt that the establishment of a Committee headed by a Minister of State to deal with the reconstruction and rehabilitation of the earthquake area which will have sole responsibility for planning and carrying out all the tasks required in the sphere of economic and social activities, and for administering all the national and foreign resources earmarked for these purposes, is a clear indication of the manner in which the Government proposes to carry out these functions. The earthquake area has close links with the rest of the Peruvian economy, but particularly with the adjacent departments, whose development projects and possibilities are directly related to the measures being taken in Ancash, La Libertad and Huánuco.

There is therefore a huge job to be done in connexion with economic and social planning for this region, pre-investment activities and the identification of projects, and the conception of multi-purpose development projects associated with basin-wide river development or the utilization of other natural resources. Since both ECLA and ILPES have acquired a great deal of experience and special knowledge in these fields, it seems logical for them to offer the Government of Peru special co-operation in the rehabilitation of the area laid waste by the earthquake, quite apart from any human and financial assistance they may provide in the normal way. Although the number of experts, their field of activity and the period for which they would be required are matters for the Reconstruction and Rehabilitation Committee to decide, the Mission wishes to say, merely in order to express its recommendation in quantitative terms, that, in its view, eight experts would be needed at the outset—two in general and regional planning, one in regional financial machinery, one in transport, one in energy, two in multi-purpose development projects, and one in natural resources.

Accordingly, it is thought that the Committee of the Whole may wish to adopt a recommendation embodying the following basic ideas:

(1) ECLA should provide emergency technical assistance and encourage the Governing Council of ILPES to do the same and to collaborate in the planning of the reconstruction and rehabilitation of the earthquake area and adjacent areas, independently of the co-operation which Peru normally receives;

(2) A request should be presented to the United Nations Development Programme for adequate immediate financing for any missions of experts that Peru may request in these fields, for at least one year;

(3) The General Assembly should be asked to approve an appropriate increase in the next annual budgets to cover this emergency assistance for as long as the Peruvian Government and ECLA think fit;

(4) ECLA should propose to the Peruvian Government and to the United Nations that it should act as co-ordinating agency for all technical assistance to be provided by United Nations agencies. ECLA would carry out its co-ordinating function through the Resident Representative.

(b) *Technical assistance from the United Nations specialized agencies and the UNDP emergency programme*

It goes without saying that in their different spheres, the United Nations specialized agencies could make a very useful contribution to the work of the Reconstruction and Rehabilitation Committee in the preparation of prefeasibility studies for investment and research projects, and in helping the administrative authorities to meet the new tasks with which they are faced. It is of course too early for the Government of Peru or the Commission to be able to determine the precise nature of the problems or how urgently the co-operation of experts from FAO, UNESCO, UNIDO, WHO, etc., may be required in each case. On the other hand, it would obviously be advisable to set up special programmes for such matters as housing, earthquake research or the prevention of avalanches in the Cordillera Blanca, stabilization of lakes, etc. The last point, for example, has already been a subject of concern in the past and will be all the more so now; suffice it here to recall the work of the members of the Kinzl and Schneider mission in the 1930s, the Heim mission in 1946 and the studies of the Ranrahirca avalanche in 1962.

At the same time, full advantage should be taken of the fortunate circumstance that the Governing Council of UNDP is currently in session in Geneva, and is scheduled to close its meeting after the Committee of the Whole has considered the situation in Peru. It would therefore be extremely useful, given the circumstances of the disaster, for the Committee of the Whole to request UNDP to allocate a lump sum to help finance the technical assistance projects of the various agencies, even though they have not yet been formulated by the Reconstruction and Rehabilitation Committee, rather than wait for another regular meeting of the UNDP Governing Council.

It is no easy task to estimate the financing required for an operation of this type but, inasmuch as assistance projects normally last between eighteen and thirty months—some being rather shorter and others considerably longer—it should be possible to think in terms of an over-all authorization corresponding to sixty expert/years, which would include the sum required for the ECLA/ILPES programme suggested under paragraph (1) above. Final decisions would of course rest with the Administrator of UNDP.

If adopted, this proposal could take the form of a recommendation by the Committee of the Whole to the Governing Council of UNDP.

(c) *Recommendation to States making voluntary contributions to the United Nations Development Programme*

Peru's reconstruction and rehabilitation programme is a long-term project. Therefore, in addition to immediate and emergency cooperation from UNDP in taking the important short-term measures which will have to be initiated long before the end of the emergency phase, Peru will undoubtedly have to receive continuing technical assistance from the various United Nations agencies for many years, and this assistance must not affect the country's normal programmes if undue delay is not to be caused in programmes for other areas which are also in need of aid. At the same time, this special programme for Peru cannot be allowed to diminish UNDP's technical assistance programmes for other developing countries.

In the circumstances, it is felt that the Committee of the Whole should request the States which make voluntary annual contributions to UNDP's funds to make a special additional contribution for a number of years, exclusively to meet Peru's emergency needs deriving from the disaster.

(d) *Extending permanent authorization to the Administrator of UNDP to take action in the event of natural disasters*

Peru's case illustrates the fact that UNDP was able to take immediate action merely because the disaster happened to coincide with a regular session of the Governing Council. Had this not been the case, it would have been months before this agency could have done anything to consider the situation, and its immediate action would have been confined to the limited authority which the Administrator now has to initiate projects without waiting for the Council's approval.

It seems desirable that the Committee of the Whole should request whatever body may be appropriate—the Governing Council of UNDP or the Economic and Social Council—to accord far-reaching powers to the Administrator of UNDP so that he can act as expeditiously as possible in the event of a disaster.

This resolution of the Committee of the Whole might take the form of a recommendation or a request to its member countries which are also members of the Governing Council of UNDP or the Economic and Social Council, to take action along these lines.

(e) *Assistance which the United Nations could provide in the event of disasters*

In resolution 2435 (XXIII) and the subsequent amendments thereto, the General Assembly authorized the Secretary-General to provide up to 20,000 dollars in emergency aid in connexion with natural disasters. This sum is completely inadequate compared with the enormous emergency requirements that have arisen as a result of the few disasters for which the Secretary-General has been able to provide a contribution, given the ceiling set on the resources he can draw upon (150,000 dollars in any one year).

According to official statistics, a total amount such as that authorized would represent, for example, 0.6 per 10^4 of the financial cost of the fifty-eight great disasters that occurred in 1966. In the present case of Peru, where it is urgently necessary to provide provisional shelter for 100,000 families, the sum that the Secretary-General could donate would only be enough to purchase 200 tents of the type required.

It would seem logical to think that the countries represented in the Committee of the Whole might request the next General Assembly to consider placing larger funds at the disposal of the Secretary-General to enable him to take effective action.

(f) *Request for appropriate action by the Economic and Social Council and the international financing agencies*

The financing agencies directly associated with the United Nations are the International Bank for Reconstruction and Development (IBRD) and the International Monetary Fund (IMF); but another important financing agency operating in the inter-American system is the Inter-American Development Bank (IDB).

It would be appropriate to present a request to the Fund and the Bank along the same lines as on previous occasions, for instance, in the case of the situation created in Chile as a result of the disaster of 21 and 22 May 1960 (see document E/3402–E/CN.12/AC.46/4), following prior consultation with the Government of Peru of course; this would be particularly necessary in the case of the International Monetary Fund.

The Government of Peru has lost no time in requesting funds from the International Bank for Reconstruction and Development and to the Inter-American Development Bank (150 and 35 million dollars, respectively). Both institutions have sent study missions, and in IDB at least—the only one on which the ECLA-ILPES Mission was able to obtain information before the preparation of the present report—there exists the greatest willingness to take rapid action.

It would seem advisable for the Committee of the Whole to support swift action by IBRD, at least to the degree that it has done on previous occasions; but a more positive move would be to obtain the support of the individual member countries which are represented on the Boards of both IBRD and IDB, and ask them to express the wish for favourable action on requests in connexion with disasters such as the one that has occurred in Peru.

Apart from this action, for which investment resources could initially be made available, it would be advisable to consider whether, in the face of a disaster situation affecting a large area of a country, it would not be possible to obtain unorthodox forms of financing from these institutions, such as approval of programme financing, the setting up of consortia, or any type of multinational action which could channel the funds made available and co-ordinate the action taken by the international financing agencies and those provided under bilateral financial co-operation agreements. In this way, the preparation of specific projects within the over-all programme could be speeded up and the conditions would be much more favourable than under the usual slow procedure of project-by-project approval.

Since the second part of this recommendation is addressed to non-United-Nations agencies and to countries acting outside the ambit of the United Nations, it could take the form of a wish or a suggestion expressed in connexion with the first part of the recommendation. The Mission does not know enough about the international machinery to specify the means of carrying out the above idea; but it considers this idea to be very important if Peru—or any other country in similar circumstances—is to be able to act with speed.

(g) *Co-operation of the International Development Association*

As is well known, given IDA's special purpose, only the low-income countries can apply for funds from this affiliate of IBRD. Peru is not one of those countries. All IDA credits have been for terms of fifty years, free of interest—and with only a small service charge.

It would seem logical to suppose that, given the high cost of a great natural disaster, in social and financial terms, for any under-developed country, such a catastrophe should make it eligible to apply for an IDA loan for the reconstruction of the devastated area.

Consequently, the Mission would suggest that the Committee of the Whole should approve a recommendation that all countries urge the relevant body—in this case, probably the Board of Governors of IBRD—to request and approve an amendment of IDA's statutes to enable it to provide aid to any under-developed country which suffers a large-scale natural disaster, even if it is not normally entitled to request a loan. This decision might possibly be taken by the Bank's Board of Governors. The Committee's recommendation should therefore be addressed, in the first instance, to the Governors who represent the member countries of the Committee of the Whole, so that they may take steps immediately to secure the proposed amendment.

The ECLA-ILPES Mission has deemed it fit to confine itself to giving the arguments which justify each suggestion and the ultimate result it is hoped to achieve. The form of the resolution, decision or recommendation adopted by the Committee of the Whole, the organ or level to which it should be addressed, and the form in which it should be presented are matters which do not lie within its competence.

RESOLUTIONS ADOPTED BY THE COMMITTEE OF THE WHOLE AT ITS SIXTH EXTRAORDINARY SESSION

297 (AC.63). INTERNATIONAL CO-OPERATION IN CONNEXION WITH THE DISASTER WHICH OCCURRED IN PERU ON 31 MAY 1970

The Committee of the Whole of the Economic Commission for Latin America,

Considering that the northern region of Peru has recently suffered the effects of an earthquake, which has caused immense loss of human life and property and a massive disruption of the country's economy,

Taking note of the report submitted at the present session by the Government of Peru on the extent of the damage and its plans for reconstruction,

Taking note of the report of the Executive Secretary of the Commission on the situation in Peru as a result of the disaster of 31 May 1970,

Bearing in mind that assistance to a Member of the United Nations which has suffered a natural disaster of such magnitude is in accordance with the concept of international solidarity embodied in the Charter of the United Nations,

Taking note of the assistance furnished to Peru by Member States of the United Nations and other countries and of the preliminary aid measures taken by the Secretary-General, the Executive Secretary of the Economic Commission for Latin America, the Directors-General of the specialized agencies, the United Nations Children's Fund, the World Food Programme and the Organization of American States, and by other international organizations, foundations, and private individuals,

Considering that the Government of Peru will begin immediately the work of reconstructing and rehabilitating the affected area and that, among other measures, it is drawing up a special medium-term and long-term technical assistance programme as part of an over-all plan, with the participation of the United Nations Development Programme (UNDP),

1. *Expresses* to the people and Government of Peru its deep sympathy on the loss of life and devastation caused by the recent disaster;

2. *Urges* member Governments of the Commission to continue their co-operation for the purpose of relief and for the purpose of reconstruction and economic rehabilitation in the stricken region;

3. *Thanks the Secretary-General for the rapid action he has taken in this emergency, and requests* him to continue his active co-operation with the Government of Peru and to promote, with its agreement, concerted international action to mobilize the necessary technical and financial resources to carry out the reconstruction plans;

4. *Recommends* that the Economic and Social Council, in view of the serious situation which Peru is experiencing, request the international credit institutions to give urgent and sympathetic consideration to emergency measures in connexion with the loans requested by Peru for the task of reconstruction, of the greatest possible magnitude and on the most favourable terms, and that it also request the international credit and development agencies and institutions to accelerate, taking into account the magnitude and requirements of the rehabilitation work, the granting of such loans requested by Peru prior to the natural disaster as are still under consideration;

5. *Recommends* that the Economic and Social Council invite countries which are creditors of Peru to take into account the grave emergency which it has suffered and the demands created by rehabilitation, in relation to restructuring its external debt;

6. *Requests* the Secretary-General of the United Nations to ask the Governing Council of UNDP, the specialized agencies, the International Atomic Energy Agency, the International Bank of Reconstruction and Development, the International Monetary Fund, UNCTAD, UNIDO, UNICEF, UNITAR and the World Food Programme to devote the largest possible volume of resources, within their respective

programmes, to meeting assistance requests from the Government of Peru relating to reconstruction work contemplated in its initial emergency programme;

7. *Expresses* its gratitude for the emergency measures taken on this occasion by the UNDP authorities and the specialized agencies and conveys to the Governing Council of UNDP its desire that the Governing Council decide favourably on requests for assistance to be submitted by Peru in connexion with the special medium-term and long-term programme of rehabilitation;

8. *Requests* the Economic and Social Council to recommend to the Governments participating in UNDP that, taking into account the special needs of Peru, as well as other exceptional needs and the normal requirements of the Programme, they should make additional contributions to the Programme, in so far as the existing resources are not sufficient to meet those needs;

9. *Requests* the Governments of the States members of the Commission to ask their directors in the International Bank for Reconstruction and Development to give particular attention to Peru's need for funds to finance its programmes of rehabilitation and reconstruction and to study the possibility of special machinery and procedures which would permit total financing of the projects relating to those programmes;

10. *Requests* the Economic and Social Council to urge the International Bank for Reconstruction and Development to give special attention to the serious situation in Peru and its need for resources, bearing in mind the principle underlying the Bank's policy, namely, that the problems of reconstruction are inseparable from the problems of economic development and the need for participation by the International Finance Corporation and the International Development Association within their respective fields of competence;

11. *Requests* the secretariat of the Commission and the Latin American Institute for Economic and Social Planning to continue to provide the fullest possible co-operation in response to the requests they receive from the Government of Peru in respect of the economic, social and technical questions within their competence;

12. *Requests* the Economic and Social Council to consider the possibility of recommending to the General Assembly that it expand the authorization granted to the Secretary-General under General Assembly resolution 2435 (XXIII) and subsequent amendments thereto so that he may adequately meet the needs for assistance in cases of natural disasters.

Adopted on 23 June 1970

298 (AC.63). The situation in Peru following the disaster of 31 May 1970, and international co-operation

The Committee of the Whole of the Economic Commission for Latin America,

Bearing in mind the distress felt by all mankind at the news of the earthquake that resulted in the loss of over 60,000 lives and the devastation of an area covering almost 100,000 square kilometres in Peru, leaving tremendous material damage in its wake,

Bearing in mind that this catastrophe befell Peru at a time when it was beginning to achieve a major development effort, thus obliging the Peruvian Government and people to concentrate all their energies on the reconstruction of the destroyed areas,

Bearing in mind that the United Nations lacks adequate machinery to undertake commitments of the magnitude necessary for the reconstruction of the devastated regions of Peru,

Considering that the international community must find a way for Peru to receive the necessary aid, in keeping with the sympathy expressed by all peoples of the world over the Peruvian tragedy and the desire of those peoples to assist in the rehabilitation of that country in the most appropriate way,

Decides:

1. To request the Economic and Social Council to recommend to States Members of the United Nations the establishment of an Emergency Fund for cases of natural disaster to be made up of voluntary contributions by all members of the international community, whose first activity would be to make available to Peru, through the competent United Nations bodies, all the financial and other resources needed for the reconstruction of the devastated regions, on the basis of such projects as the Government of Peru may prepare in that connexion with the help of the United Nations Development Programme. This Fund, which will be made available to Peru on a non-refundable basis, could consist both of contributions in freely convertible currencies and of the equipment and raw materials needed for the execution of the reconstruction projects. It would also cover payment by the contributing countries of the expenses incurred in dispatching the necessary experts;

2. That the Economic and Social Council should request the Secretary-General of the United Nations to undertake to promote interest in the Fund among States Members of the United Nations.

Adopted on 23 June 1970

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